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MINISTRY OF LABOUR AND NATIONAL SERVICE

THE WORKER IN INDUSTRY

A Series of Ten Centenary
Lectures delivered during
Festival of Britain Year

1951

LONDON : HER MAJESTY'S STATIONERY OFFICE
1952

INTRODUCTION

THESE lectures were given under the auspices of the Ministry of Labour and National Service at various dates in 1951, the year of the Festival of Britain. It was a year of Exhibitions of all kinds and in all places, at which the townsman, the countryman and visitors from overseas were shown the pattern of things as they are in this country now against the background of what they used to be. The Ministry of Labour and National Service encouraged by many friends in the industrial world and with the ready and practical help of employers, trade unions, voluntary associations, professional institutions and many others, presented its own Exhibition in London, under the title of "Manpower : The Human Factor in Industry."

In association with this Exhibition, the Ministry arranged a series of "Centenary Lectures" by leading authorities on different aspects of the dominant theme—how to make the most of the human element in productive processes, for the sake equally of the individual and of the community. The texts of these lectures are now made available to a wider circle than the audiences to which they were delivered. Each of them deals with a separate facet of the major subject, traces the evolution of current thought and practice, and projects the lines of possible further progress by research and experiment.

The keynote of these lectures is practical rather than academic. Whether the special topic is the young worker or the ageing worker, the disabled or the technologist, the health and environment or the safety of the worker, training, industrial relations, wages policy, or the international aspect of labour questions, each represents a contribution to the study of a problem which is not only of today but of tomorrow. Economic conditions may change from time to time. But industry will always need human hands and brains. In its own interests, as well as those of the workers who serve it, it behoves industry to use those hands and brains wisely and well.

On my own behalf and, I am sure, on behalf of my predecessor, the Rt. Hon. Alfred Robens, who initiated the series, I wish to acknowledge the debt which the Ministry of Labour and National Service owes to all those who took part in this series of lectures. It is my hope that their publication will stimulate thought and help to guide action in matters which are so important to us all.

A handwritten signature in black ink, appearing to read "Walter Monckton".

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Minister of Labour and National Service.	

MINISTRY OF LABOUR & NATIONAL SERVICE
CENTENARY LECTURES

The Nation's Youth and Manpower Needs

by The Rt. Hon. LORD PIERCY, C.B.E., B.Sc.

Thursday, 12th July, 1951

PART OF the plan of these lectures is a retrospect of 1851, and I will attempt as much as may serve to throw up the contrast between the problems of that day and of this.

1851 in a way is not so long ago. Our grandfathers, many of them, were still vigorous. But their world, when one examines it in detail, has become archaic. This is true not least of the industrial world in which they moved.

In 1851 a large part of the furniture, so to speak, of our industrial world was missing. I am not thinking so much of the physical facts. It is true that the telephone had not been invented ; there was no electric light, and little gas. There was no petrol engine and no motor car. Railway construction had made considerable progress ; but the railway boom and the great period of construction was still a few years ahead. The country was intensely rural. Textile mills strung themselves out by the side of Yorkshire and Lancashire streams, but the main part of the industrial population was concentrated densely in factory towns. The material apparatus which permits the diffusion of great cities was not then in existence. Equally, the arts of healthy life in towns had not been mastered. The picture springs to the mind as soon as one begins to cast back.

More to our purpose is the difference in the organisational pattern of the industrial world. There was no public system of elementary education ; broadly speaking the child population of that age did not go to school ; the state spent £150,000 in 1851 compared with the £150 millions of 1951. The factory code was rudimentary. In the textile industries hours for children under 13 and young persons had been limited. Work in mines by women and young children was forbidden. The first factory inspectors —four of them—had been appointed in 1833. A peak was reached in 1847 with the Ten Hours Act, for all young persons, the fruit of a long agitation. More than a decade was to be spent in devising enforcement. Trade unionism, discouraged by the failure of the Chartist movement, was just about to develop the pattern of building up funds, employing paid officials and concentrating on recognition and collective bargaining, which triumphed later in the century. The great amalgamations and federations to which we are accustomed were far ahead ; activities were local and sectional. National wage structures were unknown. There were no social services except the Poor Law ; and its administration was based on the principle of Less Eligibility and the General Workhouse. The respectable poor avoided it. There was no organisation of the labour market, neither labour exchanges nor unemployment insurance. The management of industry was still patriarchial. The management grades with which we are familiar were embryonic ; the capitalist employer dominated the scene.

All this applies to factory industry and the company or large partnership. The industrialisation of the country, however, was by no means complete. Over a quarter of the male population was engaged in agriculture. One in nine of all women over ten were engaged in domestic service. There were more shoemakers at work than coal miners and there were only about 250,000 professional workers. The characteristic middle class type was not the salaried man but the independent small trader and manufacturer.

Looking at the picture as a whole there was still a more fundamental difference. There was nothing in that age which could be called manpower policy; for there was nothing that answered to the concept of national planning. The political philosophy of the time and its practice were dead against that. It was the age of *laissez faire*.

If a time traveller from this age could fetch up in the year 1851 to look at the manpower problem from the special angle of this lecture, he would find the basic elements very different from those which face us. I will mention three.

The population of course was smaller, 20 millions for the U.K. then, compared with 50 millions now. That, however, is not the salient difference. It was a rapidly expanding population. In the decade leading to 1851 the population of England and Wales had grown by 12.7 per cent from 16 to 18 millions; in the succeeding decade it was to grow by 11.9 per cent from 18 to 20 millions. If emigration is added back the natural increase is even greater, 14.2 and 15.1 per cent. This compares with our almost stationary population: 2 per cent natural increase only in the decade 1931-1941. The birth rate in 1851 was 35 per 1,000 of total population and John Stuart Mill could still speak of the "devastating torrent of babies". But infant mortality and the overall death rate were high; expectation of life was lower than today. As throwing a sharp light on these conditions one is tempted to quote figures for Preston for 1837-1843. There for operatives the average age at death was 18 $\frac{1}{4}$ years, the reason of the low average being that deaths of children under 5 years old were 44 $\frac{1}{2}$ per cent of all deaths. This is the case of a new cotton town. Still it was a rapidly if wastefully growing population.

This leads me to a second feature. Our time traveller would find what we call the age composition of the population very different from now. The most obvious point about age composition is the proportion between the numbers of the working population and those of the young and the old, which the active part has—by and large—to support out of its current production of goods and services. If we apply the yardstick which we should use today—the proportion of ages 15 to 65 to the sum of the younger and older ages—we find that the active part was almost exactly 60 per cent in 1851; today it is 68 per cent. This at first blush looks favourable to us; though when I reach my next point I will have to show that the yardstick did not apply in 1851. But before I come to that there is another point: the relative proportions of the old and the very young. In the 1851 population there were 35 per cent below 15 and 4.7 per cent above 65 years old. Now the figures are 21.5 per cent children and 10.4 per cent over 65. The working-age group is likely to fall over the next few decades: the number of those over 65 may be expected to grow from about 5 millions today to

about $7\frac{1}{2}$ millions in the late '70's. Now the standard of living of the old is nearer to that of the rest of the community than it was a hundred years ago, and in terms of economic burden on a possibly declining population this is a serious prospect. In terms of expenditure from Government funds, which is a partial index, the Government actuaries estimate that the present cost of pensions—£260 millions, will rise to £421 millions in 1968 and £501 millions in 1978. This increase will have to be met out of taxation. The figures allow nothing for rise of prices or future political pressure for increase in pensions. In 1851 there was no prospect like this; the trend of age composition was still favourable. Now it is against us.

The last main feature is a somewhat elusive question: the amount of labour time that can be got out of a given population X. This is not the whole problem of utilisation for it leaves efficiency out of account. However, was the brute quantity of labour-time proportionally greater for the 20 millions of 1851 or the 50 millions of 1951? The answer is influenced by many factors but by two chiefly—the structure of employment and the individual hours worked; and here we know that the Victorians worked immense hours per day and per year and they made a large use of child labour. Consider this analysis of about 20,000 persons employed in a calico printing works in 1843:—

	<i>Per cent</i>
Children under 13 ..	28.3
Young persons 13-18 ..	26
Adults 21 and upwards ..	45.7
	<hr/>
	100.0

Light is shed on the first figure—28.3 per cent of children—by the analysis of a random sample of 565 children, which showed that nearly $2/3$ rds had begun to work before 9 years old. I must admit that percentages of the different classes employed in the textile industries as a whole gives a lower percentage of children than the above both in 1838 and 1850; still there is nothing like pointing up a case. As to hours, it is perhaps enough to recall that the achievement of a legislative ten-hour day in 1847—and then only for young persons—was a triumph of agitation. All these particulars relate to work in factories: conditions were worse in the homes of independent workers and the establishments of small masters.

What was the problem of that age for an organiser of manpower? It was not the adequacy of the present or prospective supply of labour—fertility showed no decline. It was not the fear of an insufficient demand for any labour which came into existence. We can say this perhaps with more certainty than he could have felt, of course, because we know that within 25 years from 1851, Great Britain was to become the forge of the world, the world's carrier, the world's ship-builder, the world's banker, the world's workshop, the world's clearing house, and the world's entrepôt; and in any case in that day there was always emigration for the surplus population.

The problem for him, as for us, lay in the direction of utilisation. It was a problem of the orderly exploitation of labour power. Current conditions were immensely wasteful of manpower, especially of youth. What was essential was to set up a rational day and a rational week, to stop the exploitation of the very young, and to safeguard the employment of young people and women. Factory conditions had to be improved in respect of accident, sanitation, and the rest. An orderly wage structure had to be built up ; our time traveller would have approved of the clean bill which was to be given in 1867 to the activities of Trade Unions. The provisions of education was necessary to take up the leisure of the young. These would have been the preoccupations of a national manpower planner. The background to his efforts would have been a social problem concerned even at that late date with bringing into existence the rudiments of a wholesome town life, including sanitation and water supply. His plans would necessarily have been coloured by the political prepossessions of his age which were concerned beyond everything with liberty. In the intervening 100 years we have managed to combine order and liberty in the industrial world.

The problem of this age is not full employment, though that is currently set in the forefront. It may be that we know the technique for that. The primary problem is such a utilisation of manpower in industry as will make good a popular claim for a standard of living which our existing resources and technique will with difficulty afford. It is a question of efficiency—a greater *per capita* production ; a production that will permit more saving and investment as well as a high consumption and massive social services. The problem with us has a difficult setting. We live to a large and irreducible extent by exports and we are in an historic phase when the terms of trade seem likely increasingly to turn against us and we must export more in order merely to live as well. The age composition of the population, more especially the trend, and the greater desire for leisure, are other features of this setting.

The elements of our production problem no doubt are many : technique and organisation ; management ; leadership in designing new products and in finding and developing markets ; and, by a slight extension, overseas investment policies aimed at opening out bottlenecks and increasing supplies of food and staple commodities. Such policies will involve investment, which must come out of savings, which again in turn must come out of current production. It is not my purpose to look at the whole problem, but only at one aspect of it—the supply and utilisation of manpower, which you may say is one-half of the total problem. It is possible to sort out some of the main strands in the manpower problem. I shall speak of three : the educational system ; training for industry ; and the Youth Employment Service.

The educational system is a major factor. We have chosen to have as part of our modern standard of living an educational system which gives education on widely conceived lines to all children up to age 15 (later 16), to a large proportion up to 18 and to some 10 per cent of the population education up to 21 or older in the university. This undoubtedly is one of the best features of the Welfare State. It affects the manpower problem, however, in two ways :

1. It withdraws for the period of education a substantial quantity of potential workers from industry ; combined with the effects of lower birthrate, recent educational changes reduced the intake into the industrial system of boys and girls aged 14 to 18 from 668,000 in 1937-8 to 200,000 in 1947-8 ;
2. It releases the young person for industry at an age which is late if compared with former ideas and thereby has transformed the problems of reception into industry and of training. It must be remembered, too, that young persons now come into industry with the aspirations and demands of young adulthood.

The pattern of the educational system has attracted some of our best brains. Much of its distinctive features in the present day is new. Its place in the life pattern of the population has become far more significant. It may be that this has posed new and as yet unsolved problems for the educationist on the relation of educational curricula to life. Its chief fruit must be an improvement in civilisation ; but it cannot be divorced from some foresight of the industrial world in which in future the young person or young adult, as the case may be, will earn his own living and pay scot and lot for the privileges which he has had during the period of education and will enjoy as an adult.

That is a fundamental problem. Short perhaps of that, the educational system has done much to meet contemporary needs. Thinking citizens will remember this problem when they encounter what they may feel to be tiresome outcrops of the educational system—further education, evening classes, technical schools and the like.

Among more immediate preoccupations there is the great discussion on the possibilities of an education based on technology as such up to or parallel with university training.

At the university stage in general there are problems. The university curriculum has swallowed engineering and agriculture, though not yet technology. I am no advocate of greater inroads of purely vocational training into university education ; but in certain respects the relation of the university to life needs some readjustment if on the one hand the entire social field is to be irrigated as it should be by a continuous stream of well educated men of ability, and on the other hand every trained university man is to find a suitable career.

My second topic is training.

The recruit to industry—and all the subjects of the educational process become such at their appointed time—should make his appearance with a general background of knowledge and developed intelligence. In some cases he will possess the foundations of a vocation. But the reception and training of the recruit will rest with industry, and here again there is much to be said.

The scarcity of the young recruit in our day, has greatly increased the sense of responsibility of employers in taking them into industry ; and by the same token it has dried up a lot of blind-alley employment. This, however, is only the beginning of the matter. To secure the best results

there must be carefully devised arrangements for the reception of the young person into industry ; and there should be carefully planned arrangements for training, including apprenticeship where appropriate. The study which has been given to training for industry, and the development of practice in training by the best managements, is one of the most encouraging features of our time. It took a great step forward during the war and the impetus has not been lost. The progressive employer has done a great deal ; on the other hand it is a field in which, from the earliest times, the Trade Unions have naturally and rightfully held a commanding position. The introduction of a comprehensive Youth Service has given a stimulus to the formulation of national schemes for the training of new entrants into industry, on the basis of agreement between both sides of industry. A very large number of these schemes have now been set up. The arrangements agreed upon do not, however, in all cases carry through to the locality. Besides that there are a number of industries where the schemes required are necessarily local rather than national in character. It is one of the needs of our time to improve the application of these schemes, and as the Minister will know, the Youth Employment Service is continuously and actively engaged in pressing for this at all levels. We should be very glad of active interest by the Trade Unions great and small—especially at the operative level, which is administration.

There is of course a general point on training. In the future which stretches before us, with a more versatile and better educated population of young people, we hope that flexibility and versatility will manifest itself in industry, especially at the point of entry, and at opportunities for change and promotion, and that old inhibitions and some of the old demarcations will go.

I come to my final topic. A major post-war contribution to the manpower problem is the establishment of the Youth Employment Service. The roots of this go back a long way, but the existing comprehensive service derives from the remarkable Ince Report of 1945. This was translated into an Act in 1948, although progress had been made meantime in setting up the new organisation.

The former elements, which were partly services purely of the Ministry of Labour and partly of the Education Authorities, were fused into a single national system under the responsibility of the Ministry of Labour. In the deep field, the country is divided into areas, in each of which there is a youth employment office, or perhaps several, with one or more Youth Employment Officers assisted by an advisory committee representing both employers and the Unions, and specially interested persons. The Local Education Authority is responsible for the administration in most regions. The Y.E.O. works between the schools, employers, and the regional Ministry of Labour offices, in advising, and in a large percentage of cases, placing, the school leaver. As the centre he is responsible to the Central Youth Employment Executive which is appointed jointly by the Ministry of Labour and the Ministry of Education. There is a National Youth Employment Council to advise the Minister on policy, and Scottish and Welsh advisory committees. The Youth Employment Service is strictly voluntary or optional. Its aim is to guide and help young people in the

transition from school life to working life, in close collaboration with the schools. The stages are, first, advice and guidance, including skilled assessment of aptitudes, which begins in the final year of school life. Next is placing, the third is the follow-up. The service deals with normal school leavers at fifteen. It also deals with older school leavers up to eighteen in collaboration with the existing agencies, careers masters and the like. In addition, there are special services for the handicapped child, and facilities for children with special aptitudes to learn trades. The Youth Employment Officer is a new and significant agent in the employment field and the development of the service should improve the effective use of the rising supply of workers.

I am conscious of having left on one side many important problems which might well be thought to have come within the scope of my title—the optimal distribution of labour within industry for one. My single theme has been the rising supply of labour and the need of our times for the greater efficiency in the utilisation in the industrial system of this young supply. The object we must keep before us is a greater productivity of labour within the beneficent conditions which rule in our times. The proper training and application of young labour is capable of being a major contribution to the solution of this problem.

I have already observed that if we look at the world picture it shows that in the next decade or so the terms of trade are more likely to move against us than in our favour, which means that we shall have to give more for the purchase of our external supplies. The standard of life which we demand for ourselves is set high and tends to be set ever higher. The fraction of the working week, or of life as a whole, which we are prepared to devote to earning our subsistence tends on the whole to decline, perhaps because we have juster views of the value of leisure and greater opportunities for making good use of it.

I have said something about the contribution which the educational system is making and must make towards this problem, something about the part which organised industry can play, and something about the great Government effort of our times in the establishment of the national Youth Employment Service.

These are unquiet times for older people, especially those who can remember the security of the world before 1914. But youth is full of hope and vigour ; if we give youth its chance, it will make the future and make it good.

Eliminating the Wastage of Disablement

by Dame GEORGIANA BULLER, D.B.E., R.R.C., J.P.

Friday, 20th July, 1951

IT HAS been said that there have been more changes in the life of the community during the last hundred years than in any comparable period in the history of mankind. Whether or not this claim can be substantiated, it is certainly true that the last hundred years have seen a most dramatic revolution in the position of the physically disabled. To realise the truth of this we have only to reflect that in 1850 there was opened, as a rather daring experiment, the first workroom for the employment of disabled women under sheltered conditions, and in 1950, in that year alone, over 154,000 disabled people were placed in open industry by the Ministry of Labour.

Until the latter part of the 19th century the history of the disabled was one of almost unrelieved darkness. In the days of antiquity their problem was solved by the simple method of destruction. Strength and speed were in those days indispensable factors of survival. Consequently, those who lacked either or both did not survive. Probably they were not permitted to do so.

Hippocrates, the first orthopaedic surgeon, whose note-books still exist to remind us that nothing is new under the sun, grasped the first principles of treatment, but after his death they were forgotten for two thousand years.

During that long interval the darkness of the cripples' world was deepened by the teaching of the Church. Physical deformity came to be regarded as an act of God. The cripple was set apart from the community. A stigma rested upon him, since his physical disability was presumed to be associated with spiritual evil. We may not dismiss this outlook as a mere matter of medieval superstition because, though its origin has long been forgotten, its effect has persisted even into our own days. Quite recently I heard a young industrialist assert that, if disabled people were to be employed in any numbers in a firm, there would be a danger of their conspiring together against the Management. He was a very modern young man and would, no doubt, have been surprised if he had realised that his attitude towards the crippled had its origin in the same mental background from which arose the belief that any lame old woman owning a black cat was likely to have nightly dates with the devil, to which she journeyed on a broomstick.

The ancient deeply rooted suspicion of the physically disabled is not often so blatantly expressed in these days, but it is still in the subconscious mind, nonetheless. It is this which sometimes induces devoted parents to refuse treatment for their crippled child rather than admit the possession of one. It is the cause of that profound objection to the use of the word "cripple" which is shared by all disabled people.

One of the consoling facts of life is that the pressure of great evils often distils some essence of good. The dawning realisation that disabled people were not to be dreaded or despised, and that their lot might even be improved by attention, slowly emerged as a result of discovering in the

early 19th century how largely society was responsible for the manufacture of cripples. Lord Shaftesbury made this very clear when he forced a reluctant community to consider some of the evils attendant upon the Industrial Revolution. In passing, however, it may be worthwhile to note that the process did not start with that Revolution. For example, lace-making, as carried on in the home in pre-industrial days, is said to have always involved distortion of the child-worker's spine. In much earlier times parents were found willing to sell their deformed children to the King's Court as objects of amusement and even themselves to create the deformities which put a premium on this type of merchandise. The effects of cupidity on the one hand and the driving force of poverty on the other, did not make their first appearance with the Industrial Revolution.

In the 19th century, for the first time, the conception of a cripple as a human being with not only a body which might be treated, but even a mind to develop, slowly took root.

By the turn of the century an immense advance in the treatment of crippling diseases had been achieved. Orthopaedic surgery had become established as an important section of medical science. Moreover, in 1899 the first school for physically defective children was opened in London—a voluntary undertaking which pointed the way for State action. The vital need for such provision can be appreciated from the evidence presented to a Parliamentary Committee dealing with the subject which told of crippled children waiting helpless and solitary in locked rooms for twelve or fourteen hours a day whilst their mothers were away at work. Although generally improved social conditions may prevent so frightful a situation occurring now the educational facilities for physically defective children unable to attend normal schools are still lamentably inadequate. As a consequence, these juveniles, when they reach the vocational training age, are often badly hampered by ignorance of the three R's. Too often they do not get the chance to train at all but, condemned by their disability to a blind alley occupation or none, develop an attitude of mind which can be a fruitful source of delinquency.

Perhaps the most significant development, from the point of view we are now considering, was the opening in the early part of this century of Institutions such as the Lord Mayor Treloar Hospital and the Heritage Craft School which provided, not only treatment, but vocational training to prepare the patient for employment on discharge. The first recognition that cripples might conceivably have a part to play as members of the normal community.

All these advances were for the benefit of crippled children, but they laid the foundations for the tremendous leap forward in the care of the adult disabled which came with the first world war. One noteworthy effect of this event was a change in the attitude of the public towards the crippled. For the first time their problem was no longer a sectional one, realised only by a few, but became of national importance. When husbands, sons and brothers were brought into the category and scarcely a town or village was without at least one crippled ex-Service man, their whole status took on a very different aspect. Even now, however, the word "cripple" remained taboo. I remember being severely rebuked by the Secretary of State

well-known ex-Service Organisation for applying that term to men disabled in the service of their country.

The war, in fact, provided a milestone in the progress of the disabled of which the importance cannot be exaggerated. Under the direction of that great surgeon and great man, Sir Robert Jones, Military Orthopaedic Centres were established and the school of orthopaedic surgery which he created was filled with his enthusiastic disciples, drawn not only from this country but from the United States, although the significance of this development was not readily appreciated at first by the lay public.

The Orthopaedic Centres established by Sir Robert Jones included, as an important element of treatment, curative workshops in which improvement of function was achieved and the patient's morale maintained by work of an industrial nature—carpentry, engineering, etc. This formed the germ of the idea from which the whole scheme of rehabilitation and resettlement has evolved. If the operations of organised industry could be taken into the hospitals, as a means of treatment, the corollary that they could also be performed by the patient in employment later on was a logical development. Sir Robert Jones himself was fully conscious of this. He always spoke of treatment and industrial training as the two halves of the complete process of rehabilitating the permanently disabled. Unfortunately this was not generally recognised. With the end of the emergency and gradual closing down of the Military Centres, the great principles of orthopaedic surgery established by Sir Robert were carried over to the treatment of the civilian, but the significance of the curative workshops was largely overlooked and, with one or two notable exceptions, was accepted, if at all, as exclusively an element of treatment, rather than the bridge between that and a return to normal life.

It is true that schemes were evolved for the employment of ex-Service men, but they were of limited extent and, by and large, not markedly successful. Another fifteen years were to pass before the economic potentialities of the adult disabled received serious consideration.

Meanwhile, vocational training for juveniles was being developed. Dame Agnes Hunt, whose magnificent work for the crippled should never be forgotten, had added to her pioneer activities on the treatment side the opening of a Training College for Disabled Boys, but here as in the one or two other Institutions providing such facilities, the training offered was a long-term one in a narrow range of particular crafts, such as boot-repairing, tailoring, etc., and admission was strictly confined to boys under eighteen. For some curious reason it was for long believed that no one could start training for any trade over that age or over twenty-one, as an extreme limit.

Early in the 1930's, however, a new school of thought arose. A small number of people, four to be exact, set out to demonstrate the possibility of training severely disabled people without maximum age limit for employment in organised industry, by means of short intensive courses designed to provide a basic training for a variety of industrial occupations. Little support was forthcoming. Public Authorities were politely sceptical. Almost all the big voluntary organisations for social welfare were actively hostile and did their best to strangle the scheme at birth. Mild encourage-

ment was offered, however, in certain quarters by industry itself, whence the admission came that if the scheme proved practicable—"if" being the operative word—it might point the way to valuable developments. The London and District Training College for the Disabled at Leatherhead, later renamed Queen Elizabeth's Training College for the Disabled, opened its doors in 1935. Ten months later the first batch of trainees were discharged to employment. In 1937 another Training College, working on similar lines, was opened at Exeter and before long the practical results shown by both colleges enlisted the interest of Local Education Authorities, Public Assistance Committees and the Unemployment Assistance Board.

Then war came again. As in 1914, so in 1939, the emergency produced a spectacular advance in the welfare of the disabled. This time not so much on the treatment side as in regard to their training and employment. The two Colleges just mentioned had from the first concentrated mainly on training for employment in the engineering industries and this, of course, led straight into the munitions factories. Soon, demand for College labour exceeded the supply. Employers welcomed men and boys, despite their physical disability, who had made good use of a few months' sound preliminary training in fitting and turning, welding, precision instrument assembly, etc. The supply of manpower had by now become one of the country's most vital needs, and a hitherto untapped source of labour was disclosed of which the Minister of Labour was not slow to make the maximum use. It was perhaps fortunate for the disabled at this time that he was a man of such vision and enterprise as the late Mr. Ernest Bevin.

Many thousands of disabled were employed in the munitions industries and the remarkable extent to which they held down their jobs in that time of crisis, despite long hours of work, the difficulties of transport, the blackout and so on, has perhaps never been sufficiently appreciated. It is a significant fact, which should never be forgotten, that what put the disabled on the map, so to speak, was not primarily the desire to help them, but the country's need of their help. It is true that, largely arising out of this war work, the peculiar problem of the disabled came to be recognised and the Ministry of Labour's Scheme for Training and Resettlement, followed by the Disabled Persons (Employment) Act which, with its immensely wide powers, is now on the Statute Book, had the primary object of helping the physically handicapped. Nevertheless, it remains true that the link between them and the community is a double strand, practical no less than humane. We should do well to keep both always in view.

The employer who engages a disabled man may feel that he is doing him a good turn. It is likely to be at least equally true that he is doing a good turn to himself by getting an efficient workman. Disabled people do not like being pitied and you will get the best out of them by recognising their passionate desire to be regarded as normal people. How fundamental a factor this is in their make-up cannot be too strongly emphasised, and is still not sufficiently realised. It arises from an awareness of their potentialities which, when put to the test, is amply born out by experience.

Figures compiled some years ago by the Western Electric Company in U.S.A., employing a considerable section of disabled labour, showed that both the accident rate and that for absenteeism due to illness and other

reasons was lower amongst the disabled. Similar information resulted from a Survey carried out in 1942 by the U.S.A. Bureau of Labour Statistics of three hundred firms, employing between them 63,000 disabled, and it was confirmed again in a Survey, conducted by the Federal Security Administration, of a hundred large Corporations engaged on munitions manufacture. Of these hundred firms, twenty-four recorded that the productivity rate was actually higher amongst disabled workers than for the able-bodied, whilst sixty-six stated that it was no lower.

These facts are much less surprising than may at first sight appear. The assessment of disabled capacity is normally made by the able-bodied who tend always to look for what the disabled lack rather than what they still have. People who themselves possess all their limbs and faculties assume that these must be indispensable. They do not realise that a bountiful nature provides us normally with a number of spare parts. For example, many an occupation for which we think two hands necessary can be just as well performed by one. Anybody who doubts this has only to watch a one-armed man strike a match and light a cigarette. Providing that the individual has the wherewithal to perform a particular operation, he is for the purposes of that action a hundred per cent able-bodied, no matter to what extent he may lack normal physical provision. A man whose job requires him to sit at a bench and perform purely manual labour needs useful hands. The fact that he has not got equally useful legs is quite immaterial. A surgeon friend of mine with a wide knowledge of the subject is fond of asserting that there is only one occupation in the world calling for complete physical integrity. It is that of an artist's model. Moreover, nature's compensatory methods are brought into play. It is a common-place that the blind develop a specially acute sense of hearing and of touch. People do not so readily appreciate that, on the same principle, exceptional manual dexterity is often achieved by workers confined to a chair, and that a deaf man will come to offset his limitations by the acuteness of other senses. For example, a totally deaf man who desired to train as a watch-repairer was told that this would be impossible. It was indispensable that he should be able to hear the movement. He persisted in his attempt, however, and made a success of it because he could see that for which other workers had to depend on their hearing.

Another asset possessed by the disabled is their exceptional powers of concentration. For most people work is a means to an end, for the disabled it is an end in itself. To become capable of normal employment is for them an adventure. It is doubtless for this reason that they often achieve such remarkable results during the short intensive courses of training which are provided for them. To take a few examples at random : A builder's labourer who, with no previous qualification beyond a limited knowledge of simple arithmetic, qualified as a commercial book-keeper in six months, passing the City and Guilds examination at the end of them. A man who, having been a navvy all his life, trained at the age of 53 in watch and clock repairing and at the end of a twelve months' course did well enough to become eventually branch manager of the firm who accepted him for employment. Or the almost totally deaf Dutch girl who, with only a very limited knowledge of English, learned in six months from an English teacher to become an exceptionally efficient calculating machine operator.

The extent to which these people surmount their physical disability never ceases to surprise all who have experience of them. A disabled telephone switchboard operator remarked of his first job that, although he was on a very busy switchboard, he had pretty well got his hand in. The significant fact was that he had no hands—both arms being amputated below the elbow. But, indeed, one has come to realise that such a loss is no insuperable bar to a variety of occupations. Handless clerks, arc and oxy-acetylene welders, machine draughtsmen are holding down their jobs with equal success.

Valuable latent manpower may exist in the most unlikely places and is wasted only through lack of opportunity. Some years ago a surgeon, visiting a Chronic Ward in what, in that less euphemistic age, was called a work-house, noticed a boy of about eighteen limping painfully about the ward. His suggestion that the boy might benefit from treatment was met by the assurance that it would be a waste of a hospital bed as the boy was practically an idiot. The surgeon, however, persisted and in due course, having had his lameness considerably reduced, the boy migrated from hospital to a Training Centre where he was described by the Engineering Instructor as a "born mechanic" and "star performer". He passed in due course into employment with an electrical engineering firm, which he has held ever since. As to his supposed idiocy ; it was no more than the superficial effect of having spent almost the whole of his first eighteen years in a Chronic Ward in company with the bed-ridden aged, without occupation or education.

Another boy from a Public Assistance Institution reached a Training College at the age of twenty clutching a small newspaper bundle which contained his only possessions and was handed over by an accompanying official as though he were himself a parcel. Partially paralysed, obviously terrified, suspicious and showing no sign of intelligence, he was more suggestive of a character from Dickens than a good training proposition. He did train, however, as a watch-repairer and returned to the College a few years later—this time to look for labour, because as branch manager for his firm he needed another assistant.

The potentialities of the disabled can be wasted, not only by ignorance of them but by mis-use. The right job is essential and the old theory that these people are capable only of simple repetitive operations is a complete fallacy. Unskilled work may be quite the wrong work. A man with one leg found it impossible to hold the post of messenger provided for him by a well-intentioned employer because he had always to move over oily, slippery floors. Transferred to instrument fitting, he ceased even to remember his disability and achieved a high degree of efficiency in close precision work. A young man, suffering from a type of paralysis which affected muscular and nervous control, trained successfully as a builder's clerk. His employer, unable, from his unstable appearance, to believe him mentally capable of such work, put him instead on a telephone switchboard where the need to respond constantly and quickly to different demands completely defeated him. When allowed to exercise quietly the qualifications of his training trade he was perfectly efficient in what appeared to be a much more exacting occupation.

Some employers seek to segregate their disabled workers in a group to themselves. This is, in my opinion, a mistake. Experience shows that, by and large, the disabled are at their best when mingling with the normal worker.

Much, very much, has already been accomplished as regards employment of the disabled. The Ministry of Labour's records show that in little over four years, between August, 1946, and February, 1951, nearly 900,000 passed into employment. This is an impressive figure, even allowing for the fact that it probably covers some individuals more than once. It is a tribute to D.R.O.s, to employers and to the disabled themselves. In April last, of the total registered disabled only 5.8 per cent were unemployed. But as to this figure I would comment that employable disabled are by no means all on the Register. And this for two reasons. Because many capable of employment are not recognised as being so by D.R.O.s and Advisory Committees, and are therefore rejected. And many more do not apply for registration from ignorance of what it implies.

The fullest and best use of disabled labour calls for much more study and research than have yet been devoted to it. Much valuable data already exists which, if properly correlated and collated, could be of great service in indicating the kind of occupations which have been found suited to particular disabilities, and the converse, the simple adaptation of machine or bench by which a difficulty has been overcome, and so on. Moreover, efforts should be made to extend the range of occupations in which the disabled are employed. I believe that many more opportunities could be discovered by further investigation, including the possibilities which may offer in some of the smaller, specialised industries, such for example as wig-making, mechanised invisible mending, picture frame making, etc. The widest possible field of choice is needed to meet the needs of the equally wide range of disabilities which must be catered for. It used to be thought that a one-armed man might be difficult to place. Now, with the development in the manufacture of artificial limbs, employment aids, etc., the problem presented by a man with no arms is less difficult than that of many other disabilities—for example, spastic paralysis, the slowly progressive conditions like disseminated sclerosis, or, perhaps the most difficult of all, epilepsy. One hopes that for such conditions, including the gastric group, which looms so large amongst industry's problems nowadays, medical science will gradually find a solution by new methods of treatment or prevention. That is one of many reasons for the closest collaboration between medicine and other aspects of rehabilitation. One would like to see still keener realisation in the medical profession both of the possibilities and of the problems on the industrial side; more recognition of the fact that the hospital is no water-tight compartment, but an ante-room to life, and that through its windows an observant eye should be kept on the demands of the outside world to which most of the patients must be fitted to return.

I think also there is much more room for the inclusion of the trained social worker in the picture. The category of disabled men or women who, crippled in early life, have for years past lived at home regarded as a hopeless proposition, does not readily take the initiative in seeking employment. Enterprise and determination are needed to overcome the opposition

of a sceptical family or a possessive parent. It very often becomes a matter of skilled case-work before the individual can be prised out of his or her back-water and this is not the job of the Disablement Resettlement Officer. The question may be asked : Are such people worth pulling out ? Most emphatically, Yes. Countless examples could be given of people who had spent most of their life confined to a wheelchair in the back room of their home, but who, given the chance, discover latent capacities which compare favourably with those of the able-bodied. Special training, at a Training Centre rather than on the job, is I think desirable for most severely disabled people and especially for this category who often need, not only to learn a trade but how to live in the normal world before taking the final plunge into industrial life. For those who do not live within reach of suitable work and whose disability makes it difficult for them to live in lodgings, suitable accommodation can be a greater obstacle than finding suitable employment. There is a great need for the provision of hostels and, for married people, bungalows to meet this difficulty. We must hope the time will come when local housing schemes will take account of such needs.

There are some who will always need to work at home. Much greater use could be made of such out-workers. I know there are a number of practical difficulties as regards distribution and collection of work, supervision, etc., but the method was followed under the pressure of war conditions and it could be developed in peace time, if properly worked out. Here again the latent capacity is worth using. A bed-ridden one-armed woman regularly supplies a high-class London firm, who accepted her work on its merits without at first knowing the conditions under which it was produced. This is no exceptional case. All over the country there are people whose attention is not diverted by cinema, football matches or dog tracks and whose sense of frustration arises, not from disappointment with the objectives life seems to offer, but from the absence of any objective at all, and who are prepared to take opportunity with both hands when it is offered them.

Shakespeare, as usual, has the right word :

“And when the mind is quickened out of doubt,
The organs, though defunct and dead before,
Break up their drowsy grave and newly move,
With casted slough and fresh legerity”.

I do not say that there will never be a pool of unemployable disabled. There can be insuperable obstacles to work : advancing age complicating long standing chronic conditions ; the later stages of certain progressive diseases ; a standard of mentality low enough to be itself a handicap. And, last but not least, the work-shy, the bone-idle—for the disabled are not immune from human weaknesses. One, whom I knew to possess a good many, asked me recently to help him get training, “It’s rather urgent”, he explained. “A man can’t turn over a new leaf after he is forty and you see I am thirty-nine now”.

The history of the past hundred years shows that the revolutionary change which has occurred during that time in the situation of the disabled has been achieved by the converging attention brought to bear on it from three angles : medical, educational, industrial. Along these lines progress

must still continue and there is still a long way to go. There must be a clearer appreciation of the potentialities of the disabled, by doctors and employers, by D.R.O.s and social workers, by the disabled's own relatives and, this above all perhaps, by the community at large. We must learn to appreciate the fact that physical disablement is only one of the many different handicaps to which humanity is subject, and that a bad temper or an inferiority complex, to mention only two, can be a greater obstacle to a successful career than the loss of a limb.

You may think I have been saying too little about categories and figures, too much of the individual. But this is essentially an individual matter. Mass production methods will take us nowhere in dealing with the disabled, every one of whom presents a separate problem. It is also a specialised subject, calling for scientific study. Never in our history, I suppose, has the maximum use of our manpower, to the most productive ends, been so important. We shall do well not to underestimate the contribution which the physically disabled have to offer. They have learned, in the hard school of adversity, to develop those qualities of courage and determination of which the country is now most in need.

The Effect of Environment on the Health and Efficiency of the Industrial Worker

by Professor R. E. LANE, M.D., M.Sc., F.R.C.P.

Wednesday, 25th July, 1951

IN THIS lecture I intend to :—

- (1) Show the state of affairs 100 years ago.
- (2) Indicate briefly the forces responsible for advance.
- (3) Present the state today, our difficulties and problems, with some suggestions of where we might look for answers.

THE PAST. 100 YEARS AGO

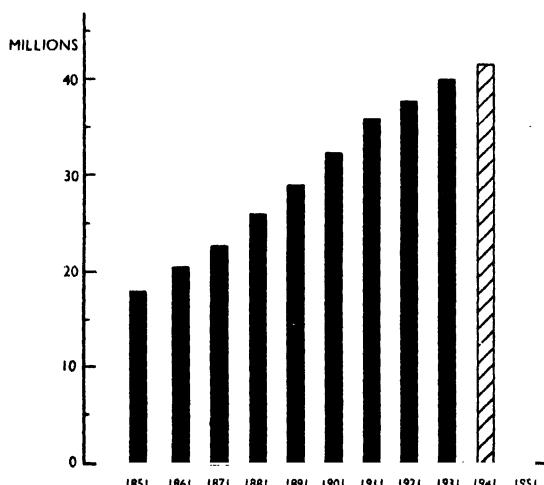
In 1851, the Industrial Revolution had been in progress for 100 years, and there were definite signs of change afoot. The seamy side of industrialisation—in town and factory and mine—was beginning to receive attention. We are all familiar with the difficulties that had been encountered. Man does not build towns and factories and instinctively know how best to live and work in them. There was a gradual awakening among the men and women of the working class in this country to the fact that there was something wrong in their world. The Chartist movement in the '40's had been an expression of this, and men in all levels of society were striving to make a new society out of this rapidly growing population.

Let us look at a few facts concerning the people of this country 100 years ago.

The population was much less than half of what it is today.

Then 18 million—44 million today.

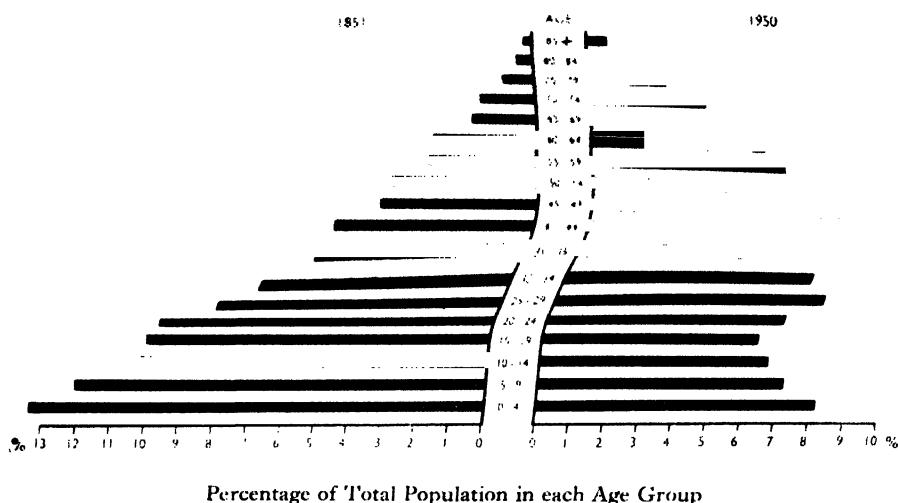
POPULATION OF ENGLAND & WALES 1851-1951



And it was a younger population.

AGE PYRAMIDS FOR ENGLAND & WALES

All Persons



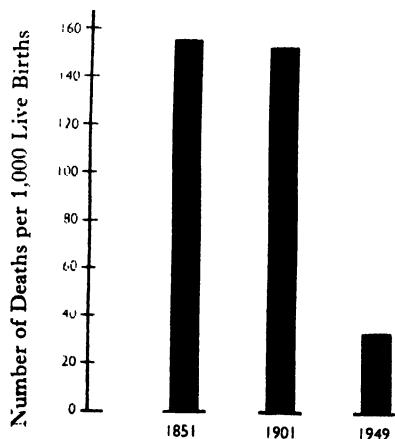
Percentage of Total Population in each Age Group

Only 27 per cent were above the age of 45, while now 35 per cent are above that age. The birth rate was twice what it is at present, and so was the death rate.

INFANT MORTALITY

England & Wales

Deaths under 1 Year per 1,000 Live Births



Infant mortality, which is a good index of a country's health, was five times its present level (154-32) and the expectation of life at birth in those days was 40 for males (as against 66 today) and 42 for females (as compared with 71 today).

What about disease? Though the standards of diagnosis were different it is illuminating to look at some of the causes of death recorded, for the two periods.

Tuberculosis claimed 36 per 10,000 of the population, while today it claims 4.5 per 10,000. Respiratory disease claimed 27 per 10,000 and today it claims 18 per 10,000. Typhus, a disease conveyed by body lice, accounted for 10 deaths per 10,000. Now we get none. While smallpox and scarlet fever figure high in the list, today deaths from these causes are negligible.

The population then was both smaller and younger and people were dying of diseases which we have since learned to control, largely as a result of advances in bacteriology.

This was the sort of population we had. If we ask why were they dying young, we have to look at the environment in which they lived, and here we must look at it all, home and work. Half the population lived in the new towns where housing was bad. In Liverpool, for instance, 15 per cent lived in cellars. Sanitation was rudimentary in the extreme or non-existent. Schemes for providing sanitation and drainage in our towns were just being considered, but had not yet got very far. The new railways were claiming so much of our capital that there was little money forthcoming for such frills. Water supplies were in the same state, and the filth of our towns so graphically described by writers of the time, was a by-word. Wages for a median family (the better of the unskilled) at this time, were about a pound a week. Cost of living was, of course, much less, and the calorie value of the diet 100 years ago is estimated as 3,240, though this was largely made up of starch foods.

WHAT OF EDUCATION?

A 100 years ago, the proportion of bridegrooms making a mark when married was one-third, and nearly half the brides. The Registrar General estimated that in one-quarter of all married couples neither partner could read nor write.

NOW WHAT WAS HAPPENING IN THE FACTORIES?

The Lancashire textile mills had received some attention, which was long overdue. Dr. Percival had been dead for 50 years, and some of the reforms for which he had worked had found their way on to the Statute Book, as a result of the hard work of such people as Owen and Lord Shaftesbury. The original little band of four Factory Inspectors had been at work for 18 years, and their efforts were beginning to bear fruit. The hours of women and children in these mills had been reduced to ten a day and, despite various evasions, this had meant a reduction in the hours of the men as well. It is interesting to read of the surprise expressed on all sides —by factory inspectors, employers and politicians, that this change was not followed by a reduction in output.

The age of entry of children was now 8, and this had to be certified by a surgeon.

Conditions in the mines had recently received attention, and an Act of sorts had been introduced in the '40's.

All this points to an awakening of the social conscience. Society was beginning to deal with some of the major problems created by the jungle tactics of the early days of the Industrial Revolution. There were many still to receive attention. Active opposition had delayed early legislation and the long period between the discoveries of the pioneers and legislation was even worse *in those days than it is today*.

ACCIDENTS

Engels had recently visited the industrial North, and this is what he had to say about the accident problem in Manchester—"A great number of maimed ones may be seen going about Manchester, this one had lost an arm or part of one, that one a foot, the third half a leg. It is like living in the midst of an army just returned from a campaign". Unguarded machinery was still the rule, and a bitter struggle lay ahead for those who were to introduce legislation to enforce guarding.

INDUSTRIAL DISEASES

Industrial diseases as such must have been rife, but were receiving little attention. Sir John Simon, Medical Officer of the Privy Council, writing in the early '60's, said—"Unboxed machinery against which he (factory inspector) now has authority to move the magistrates to penalties is indeed a real danger to life and limb ; but even though every mutilation which results from it were to be counted as a death, the deaths from unboxed machinery would probably count as nothing in comparison with those which the unventilatedness of factories occasions".—"The canker of industrial disease gnaws at the very root of our national strength".

This then was the picture 100 years ago. A new society was awakening to its new problems. The economic advantages of the unbridled *laissez-faire* period were standing the country in good stead, but the social results of this policy were becoming intolerable. The workpeople who were crowded into the industrial towns were beginning to develop a tradition—a working-class tradition completely opposite to that *laissez-faire* attitude held by the governing section of society. Difficulties for the working classes were to be overcome not by competition, but by mutual aid, and this conception of solidarity has gradually grown—its results are producing their own problems. But it could not achieve much alone. It has always needed the support and guidance of those with special skills and technical knowledge. Fortunately in this country there have always been experts ready to assume this responsibility—engineers and lawyers, doctors and industrialists. Medicine illustrates well the place of such men and the advance in our public health in the last hundred years is an excellent example of the general principle. Research establishes facts. These facts have to be tested and tried by other experts, and when established must be used. This involves the approval of the people. The provision of drains and water supplies in our towns and the use of vaccination against smallpox

and inoculation against diphtheria are examples familiar to all. Preventive measures of this sort have a far greater effect on the health of the country than curative medicine, but they must have the support of the majority of the community before they can be applied.

Industry followed a similar pattern. The early pioneers collected facts and presented them forcibly as reasons for legislation, which followed slowly and grudgingly.

Since then progress has been more rapid—in part due to the two wars which forced ahead industrial production methods and demanded a greater concern for the worker as a means to productive efficiency. The Industrial Welfare movement, pioneered so ably between the wars by Robert Hyde, and the new Factories Act, which is a memorial to the late John Bridge, are landmarks in the last 50 years.

AND SO WE COME TO THE PRESENT TIME

From the Chief Medical Officer of the Ministry of Health we learn that we are now healthier than ever before ; we live longer and lose fewer of our children in the first years of life. We have, moreover, accepted a policy of social security. The battle against Beveridge's five giants—want, disease, ignorance, idleness and squalor—has been joined. This social change has itself produced a new situation and new problems, but we still have some serious and obvious 19th century type of problems which need our attention, and should prevent any complacency.

1. HOUSING

There are twice as many marriages as houses built each year, so our housing shortage is not surprising. It is having serious repercussions on the health of many people. These are not all on the physical side for the psychological stresses involved in trying to live at too close quarters with relatives and others ; and the frustration often induced by being tethered in one place, unable to move one's job because of the housing problem are potent causes of ill health.

2. JOURNEY TO WORK

I believe it was Dean Inge who said that strap-hanging was not the answer to slum clearance, and I would most heartily agree. Long journeys to work are expensive in material, time and effort. "The journey to work" is a health problem of our time, which I think is not given enough thought. There is a tendency to allow our towns to eat into our countryside like cancerous growths, leaving a vast desolation in the centre, which if properly cleared and protected from smoke might provide space for the houses of many more people.

3. ATMOSPHERIC POLLUTION

About this there is much talk and little action. I think the time will come when future generations will regard us with the same incredulous pity as we now regard those who, 100 years ago, tolerated for so long the open drains in the streets and the garbage heaps by the back doors. We pay far too little attention to this modern evil.

These are a few of our physical problems. We at least know how to deal with these if we would, but there are other more difficult problems about the solution of which we know little. Problems for instance concerning the effect upon the family of modern conditions; these need further investigation. I mention this home side because I want to make it clear that we cannot profitably look at one aspect of environment only. What happens at home affects the man at his work and conditions at work influence a man's home life. We cannot disassociate the two in considering the health and efficiency of the Industrial Worker.

WORKING CONDITIONS

I now wish to examine more closely the working environment. The working conditions of our factories are regulated by the 1937 Factories Act. This lays down minimum standards. Very many factories far exceed these and make full use of the knowledge which now exists concerning optimum environmental conditions—heating, lighting, ventilation and the rest. But we still have many slum factories, damp, dirty, dark places, unsuitable for use as a work place, but which it is said we cannot dispense with at the present time when building is so difficult.

Our mines must always present special problems, but the National Coal Board is showing a welcome desire to investigate the special environmental problems of coal mining.

The Gowers Report has drawn attention to the need for improving the working environment and providing simple facilities in offices and shops; and the needs of the agricultural worker, which have been overlooked in the past, are beginning to receive attention.

While knowledge is available on most of these points, the optimum size of a working department is in doubt. Quite apart from the important psychological problems connected with a large department, a recent investigation has raised another problem. This is as to the possible extra danger from tuberculosis in the large modern factory, as opposed to the smaller units—even if these appear to be less well ventilated. Tuberculosis is a disease, the spread of which depends both upon the seed and upon the soil. In a large factory the infected case may be able to pass on infection to a greater number of susceptible people than is possible in a small room which will contain a smaller number of susceptible workpeople. This is an important finding and, if confirmed, it should lead to vigorous action.

ACCIDENTS

In our factories we still have about 800 people killed every year, and nearly 200,000 injured, while in our coal mines nearly 500 men are killed each year and a further $\frac{1}{2}$ million (representing one in three) are injured. These are accidents sufficiently severe to cause absence from work for 3 days or more. I am sure man has always had accidents and always will, and we cannot expect him to go unscathed in this new environment which we have produced for ourselves. We can box and fence, and introduce innumerable mechanical devices to prevent trouble, but our human characteristics will defeat them all. It is suggested nowadays that only about 15 per cent of accidents can be attributed wholly to mechanical failure.

The peculiarity of the individual, whether permanent or temporary, is of greater importance, and human failure, whether due to youth or age, inexperience or fatigue, worry or ill-health, accounts for most of our accidents.

Schilling has recently emphasized the importance of regarding industrial accident prevention as a community responsibility, more likely to meet with success in a factory with good morale.

INDUSTRIAL DISEASES

While comparatively few in number, these are important because of their effect on the working group. One case of industrial disease may induce feelings of fear or of anger in many, so their economic importance far outweighs their mere numbers.

At the present the industrial diseases of greatest importance are those resulting from the inhalation of dust, for while fibrosis of the lungs has been largely dealt with in most factory processes, there is still much to be done in certain trades. The lung diseases of coal miners have received much attention from the Pneumoconiosis Research Unit but much work, both medical and engineering is still required here. Other dusts also produce disease of the lungs without any fibrosis. These are none the less important and are extremely difficult to deal with, as our cotton industry is only too well aware.

MALIGNANT DISEASES

The fact that cancer follows exposure to certain chemicals has long been known, but slowly we are beginning to realise that there are more of these substances than was at one time thought. Because of the latent period between exposure and disease this is a very difficult field to work in, but as knowledge grows both of cancer and its biochemistry, it may be possible to forecast with greater accuracy those materials and processes which carry the danger of cancer. This is a field of research calling for the highest specialist knowledge.

RADIATION HAZARDS

Radiation hazards are new in industry, and they have been most effectively dealt with. In fact they provide an excellent example of co-operation between the medical sciences, the physicist, the engineer and the architect on a health problem.

NEW CHEMICALS

New chemicals are continually coming into use, and sometimes their danger is not realised until too late. While a few of our biggest manufacturers have the facilities, and are prepared to carry out exhaustive tests, this does not apply in other cases, and the workman becomes the guinea pig. There should be ample opportunity for assessing the effects of such substances before they reach the market.

SOCIAL AND PSYCHOLOGICAL PROBLEMS

Health, of course, is a state of mental as well as physical well-being, and from every point of view the psychological aspect is just as important as

the physical. When the primary physical needs have been satisfied, and food, warmth, shelter and some financial security are assured for himself and his family, a normal man needs certain satisfactions—approval and happy relations in his working group and some sense of being of use. The keynote of modern change, both inside and outside industry is, I think, the importance placed on the individual as a person. So far I have said nothing about this side and about some of the complications experienced in bringing people together in large groups. In the past many of these problems have been overlooked or dealt with in a purely empirical way by the good manager. More knowledge is required in this field and the widest application of existing knowledge should be our aim.

Notable contributions in this field have been made by British Research workers in the last 30 years ; Vernon, May Smith and Wyatt added to our knowledge. Probably the Hawthorn experiment carried out in the United States of America in the 1920's is the best known piece of work in this field. I am sure you are all familiar with it—how in 1925, in the factory of the Western Electric Company, a group of competent young engineers carried out experiments to demonstrate the effects of lighting upon output. Experimental conditions had apparently been fulfilled, that is to say there was an experimental room and a control room, and changes were then introduced into the experimental room one at a time, *all other conditions being held steady*. The results that were obtained were most perplexing. Production went steadily up, whether the lighting was improved or worsened, and it began to dawn on these men that the one thing they had in fact not done was to hold conditions constant. To put a group of people in a separate room, to pay special attention to them and their output, and more still, *to seek their active co-operation* had a marked effect upon them.

We have moved a long way since those early experiments of 30 years ago. The importance of psychological environment is now widely recognised and the need for the *organisation of sustained co-operation* in a group is regarded as one of management's important functions. The efficiency and the health and happiness of our workmen depends as much on the psychological atmosphere as upon the physical environment, and this psychological atmosphere is largely dependent upon the manager and his managerial staff.

Some of our new health problems are intimately concerned with modern changes in industry. In the past, we have heard a lot about monotony in mass production methods, but it is some years ago now that May Smith pointed out that monotony was only one thread in the total pattern. Work satisfaction is essential to health and efficiency, and it can usually be achieved in modern industry where management is fully alive to the problem. There is no doubt that the increased mechanisation of modern industry has taken much of the back-break out of work, and has made many of our jobs less fatiguing and more interesting. Where mechanisation, however, is badly done, and where arrangements are such that all satisfactions from work are denied to the workman, symptoms may appear, and these may take the form of physical ills.

PRESENT NEEDS

I should now like to consider some of the present occupational health problems.

1. (a) First I think an effort should be made to reduce the enormous gap that exists between established knowledge and actual practice. For thirty years, the Industrial Health Research Board has been carrying out research in this field, and the results of much of this work still await wide application ; and a similar fate has met the researches of various other individual bodies. This is not only or even mostly due to lack of money, but often to sheer ignorance of the facts. Here there are faults on both sides. A research man is too apt to stay in his laboratory, while on the other hand certain types of industrialist are apt to regard scientific investigation of human problems as outside their concern. Both are at fault, and what is needed is a firm link between the two. A research scientist usually deals with fundamental principles. The industrialist wants the practical application of these principles to his own particular industry. Sir Frederic Bartlett has recently suggested that this link might be achieved if industry sent some of its bright young technical men, familiar with its problems, to study for a short period in the occupational health laboratories of our Universities.

It cannot be stressed too often that it is industry's responsibility to provide good environmental conditions. The research departments can only demonstrate the principles. Industry must apply them. For instance, the main principles of physiological and good psychological machine design have been worked out, but it is industry's responsibility to incorporate these in the machines they build, and in fact to see that they are incorporated in the machines they buy.

(b) Much of the industry of this country is carried out in small units, and while many of these are very good, some are very bad. We know that the work of our Factory Inspectors is almost entirely educational. In view of the large numbers of factories it would seem that if they are to have any hope of success there should be many more of them. In the small factory, it is the manager alone who can deal with the health problems. He often needs much help and advice, and the Factory Inspector is one of the people to whom he is likely to turn.

(c) These Factory Inspectors often need more ready methods of assessing environmental conditions. I suggest that industrial hygiene centres, capable of carrying out simple examinations, are badly needed and should exist in each region. In this particular field we have lagged a long way behind in Great Britain. The scientific assessment of a working environment, followed by correction of faults disclosed often has a double effect, not only the improvement of the working conditions to which the particular investigation was directed, but also a favourable effect upon morale. Moreover, a simple illustration of this sort often helps to educate a backward management. Such facilities as this should be available for industry, and managements and Trades Unions should, in my view, be so trained that they ask for this assistance.

2. HEALTH PROBLEMS OF A NEW SOCIETY

Evolutionary change continues and as it goes on it presents us with new problems. A hundred years ago the most urgent need was to deal with the *physical* results of industrialisation. Today one of our most crying needs is to understand the effect upon health of some of our social changes. Just

as the sciences of bacteriology and statistics came to our aid in defeating the diseases of 100 years ago, so scientific methods must help us now.

As an example the effect of full employment upon discipline can be cited. Discipline in our factories can no longer be secured by the old methods, which are now unacceptable. There is no question of returning to the "healthy dose of unemployment" as the power from behind to keep a man at his job. But if efficiency is to be maintained discipline is essential. Moreover, for a working group to be happy and healthy it must have a sense of efficiency. Discipline must now be self-imposed and must come from within. But this great change cannot be brought about quickly. In fact, the ways of securing it are by no means clear. While the ultimate responsibility for securing this state of human relations rests with management, the methods to be employed must be worked out by research teams. This aspect of psychology has received little attention in this country as yet. It is admittedly a difficult field, but one which is worthy of the work of the best minds in the field.

THE FUTURE

Where are we to look then for progress? I think to education and research. The education of all grades of management to produce an awareness of these biological problems at all levels. But education, I maintain, should not stop with management. It should be extended to the workman himself. The 1944 Education Act was accepted on all sides as a necessary and proper measure. We must not lose sight of it. Education can help the workman to be an individual with wider interests appreciating his responsibilities, for this it should not be narrowly vocational, but should give opportunities for him to seek interests outside his work. In my view the Trades Unions should take an active part in this matter. They have, I know, long passed the stage when they regarded their only responsibility as achieving the best wages possible for their members. They have begun to pay attention to health, and it seems to me that this interest should be on the widest possible scale—not merely concerning itself with the narrower problems of industrial disease, important as this may be, but taking a wider view of health—and in my view this means taking more interest in education.

The other group to whom education and special training is necessary is that of the specialist health workers. The doctors and nurses entering industry should be properly trained for their work. Industrial medicine is a special field, and training is needed before undertaking practical work in industry.

But this is not all. Our occupational health services have recently been the subject of a report by a special committee. It has recommended the steady development of these services along the lines they have followed in the past. This decision will be justified only if managements and Trades Unions press for developments in this field.

Industry must be able to recruit men and women of good quality to this work and industrial medicine must be able to attract its due share of the cream of the profession. In addition these men and women must be trained for their work. Facilities for this have been built up at some of our Universities, but the active interest of industry is essential if these departments are to flourish. I am sure there was never a greater need to attract the right

recruits to this branch. A small number of well qualified people can perform a service to industry quite disproportionate to their numbers, and in my view could do a very great deal to promote the health and efficiency of our working population.

Finally I should like to say a word about research. Although knowledge is so far ahead of practice we cannot for one moment relax our efforts to seek for more. The problems are of many types.

PHYSICAL

Those concerned with dusts and toxic hazards are constantly with us, and demand the attention of well trained teams.

PSYCHOLOGICAL AND SOCIAL

The psychological and social problems are new and difficult. We know little of methods to be used. New techniques are required, and they will have to be slowly and painfully evolved, and will require the collaboration of the sociologist and the psychologist.

PROBLEMS OF METHOD REQUIRING OPERATIONAL RESEARCH

e.g. The most effective use of manpower in our occupational health service. Here we should like to know much more about the specialised occupational health needs of an industrial community. We must learn how to deploy our personnel to the very best advantage. How many, for instance, of the medical examinations done in industry are of value? Answers are required to these practical problems.

A wide range of research is required, and it is right, therefore, for Universities to show interest in them. It is in the Universities that much of this type of work can best be undertaken—when it is free from economic and political bias. It must always be remembered however that by its very nature this work cannot go on in academic isolation. It must have fields in which to work, and for this it must continue to receive the full support of industry.

It will be seen, therefore, that the health and efficiency of the worker is not a simple matter. Health depends on economics and on education, and industry has large responsibilities here. If we consider what are the functions of industry, they are surely to feed, clothe and house man, and to make possible his further development. Industry should contribute to the development of the men and women who serve it. Its responsibility is not fulfilled by handing the workman a pay packet, but should foster his growth and development as a national duty. The writings of many of our leading industrialists show a full appreciation of the social purpose of industry.

The health of an industrial community depends in part upon the conditions under which work is done, and upon the economic results that accrue from it—obviously the two are closely interdependent. I have tried to indicate the wide variety of our problems, and the numerous factors which influence the health and efficiency of the worker. These are ever-changing, as the nature and pattern of industry changes and as the pattern of society changes—we can never be up to date because always change will have gone ahead of action, but we can appreciate the nature of this constant change and evolve scientific methods for its study. This knowledge will provide us with the fundamentals for healthy working which must always be an essential part of the good life.

Technical and Scientific Manpower

by The Rt. Hon. LORD HANKEY, G.C.B., G.C.M.G., G.C.V.O., F.R.S.

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I. INTRODUCTION

ON JUNE 7th last in the introduction to my Romanes Lecture at Oxford University on "The Science and Art of Government" I emphasized that, "as Government is concerned primarily with human beings, human relations and human personality are a dominating consideration". That observation applies equally to the question of technical and scientific manpower, on which I have been asked to speak today, for without a large number of human beings highly trained for research, development and manufacture, science would decline, progress would be arrested, and degeneracy would set in to the great detriment of the art of Government.

Today I propose to begin, as I began the Romanes Lecture, by harking back to those ancient times from which modern civilisation derives. Then, after a glimpse at mediaeval Europe, I shall turn to the growth of our own universities, technical colleges, and scientific and technical institutions, calling attention to the marked progress since the centenary year inaugurated at the Great Exhibition in 1851 and commemorated by the Festival of Britain with which this lecture is connected. A description of the improvisations to provide trained personnel for the rapid advance of science in World War II, and of the post-war steps to adapt the system to modern needs, will lead to some concluding remarks on the future.

II. EARLY PRECURSORS, ATHENS AND ALEXANDRIA

High authorities claim that the foundations of the modern university system were laid long before the Christian era, at Athens and Alexandria. Athens came first with Plato's Academy, Aristotle's Lyceum, Zeno's Stoa and the Garden of Epicurus, providing collectively, in the words of Mr. Breasted, the American savant, "A university of four departments". Its efforts were directed primarily to the humanities although Aristotle's Lyceum was also active in natural history, botany and zoology.

Next came the Mouseion of Alexandria, which was founded by Soter, the first of the Egyptian Ptolemies (323-283 B.C.), on the model of the Athenian Mouscion, a philosophic establishment that had housed the library of Aristotle.¹ Although the Mouscion of Alexandria did not neglect the humanities, its pre-eminence was in science. To quote Mr. E. M. Forster, the local historian :

"Working under royal patronage and with every facility, science leapt to new heights, and gave valuable gifts to mankind. The third century B.C. is (from this point of view) the greatest period that civilisation has ever known—greater even than the nineteenth century A.D. It did not bring happiness or wisdom; science never does. But it explored the physical universe and harnessed many powers for our use".²

¹Mr. E. M. Forster's *Alexandria*; A History and a Guide, which, with Breasted's *Ancient Times*, *The Student's Greece*, by William Smith, D.C.L., LL.D., and Mr. H. G. Wells' *Outline of History*, are the principal sources on which this part of the lecture is based.

²Forster. *Alexandria*; A History and a Guide, pages 36-37.

On the science side of Alexandria Euclid composed his "Elements" and founded a mathematical school that lasted 700 years; Apollonius wrote on Conic Sections; and Eratosthenes the geographer measured the earth and came within 50 miles of the correct diameter. In Astronomy, the calendar we now use was worked out; and in Medicine, anatomy was taught and vivisection practised on animals and even on condemned criminals (a fearsome anticipation of Belsen) "in which way the nerves were discovered to be the lines along which messages of pain and pleasure pass to the brain".¹ I have myself spoken elsewhere on the University's contributions to defence science.²

It was to the Mouseion of Alexandria, with its famous scientists, lecture halls, laboratories, huge and well organised library, zoological gardens, park and dining hall that the youth of the ancient world (after primary and sometimes secondary education in Government supported schools) flocked for scientific and technical training and education. Thus the organisations of Athens and Alexandria, as Mr. Breasted puts it, "have become the model of academies of science and of universities ever since".³

From that fascinating episode there is one important lesson to be drawn. Unlike the Athenian schools whose income was derived from private sources, the Mouseion of Alexandria was supported by the State, the funds being administered by a priest who was appointed by the King—a prototype we can imagine of the Chairman of the University Grants Committee! But "he who pays the piper calls the tune" and, under control of the palace, which included both the Court and the Government Offices, the university experienced both the advantages and the disadvantages of Government control.

In the words of Mr. Forster :

"It was not an ideal arrangement, as outsiders were prompt to point out, and snobbery and servility taint the culture of Alexandria from the first. It sprang up behind walls. It never knew loneliness, nor the glories and the dangers of independence, and the marvel is that it flourished as well as it did. . . . In spirit as in fact the Palace and the Mouseion touched, and the Palace was the stronger and the older. The contact strangled Philosophy and deprived Literature of such sustenance as Philosophy can bring to her. But it encouraged Science and gave even to Literature certain graces that she had hitherto ignored".⁴ ⁵

In less than a hundred years from its foundation the scientific energy of Alexandria had lapsed.

¹Breasted. *Ancient Times*, page 472.

²Journal of the Royal United Service Institution, Vol. XCI, No. 563, page 344. August, 1946.

³Breasted. *Ancient Times*, page 479.

⁴Forster. *Alexandria*; A History and a Guide, pages 28-29.

⁵Mr. W. E. Gladstone described the position in a footnote to his Romanes Lecture of 24th October, 1892 (page 43), as follows :

"Alexandria" (as compared with Athens) "has much more of elaborate equipment and definite history, but presents a mechanism not merely aided but devised and ordered by the State, rather than an institution that worked by an independent life dwelling within itself."

Today when Governments are, quite rightly, spending large sums on science in their own establishments and in universities, technical colleges and the like, there is a latent danger that pure science, the basis of applied science, may be starved, and that insistence may be too great on immediate and practical results. I do not suggest that it has happened nor is likely to happen here in the near future under the present enlightened system, but on a long view Universities are right to be on their guard against the risk. As was well said by Mr. Gladstone in the first Romanes Lecture delivered in 1892 with specific reference to our own universities :

"The chief dangers before them are probably two : one that in research, considered as apart from their teaching office, they should relax and consequently dwindle ; the other that, under pressure from without, they should lean, if ever so little, to that theory of education which would have it to construct machines of so many horse-power, rather than to form character, and to rear into true excellence the marvellous creature we call man ; which gloats upon success in life, instead of studying to secure that the man shall ever be greater than his work, and never bounded by it, but that his eye shall boldly run (in the language of Wordsworth) "Along the line of limitless desires".¹

III. SCIENCE IN MEDIAEVAL UNIVERSITIES

We cannot linger long over the mediaeval universities. Some were founded by the State, notably the University of Naples by the Emperor Frederick II in 1222 B.C. ; others like Bologna, by the Popes, and many were associated with the monastic orders. Mr. Gladstone speaking, rightly in my opinion, of Theology as a science said—"it seems no paradox to say that if there be a Creator of this Universe, the knowledge which reverently deals with our relations to Him can hardly be other than the crown of human knowledge".² But, apart from that the contribution of these early universities to science was limited to a few, like Salerno, which specialised in medicine.

Three that tower above the rest are Paris, Oxford and Cambridge, all founded in the twelfth century A.D. But, even at the two latter, in early days, as Mr. G. M. Trevelyan points out, "physical science did not get far in theological swaddling clothes"³ which baffled even so passionate a scientific genius as Roger Bacon (1214-1292)—"perhaps the most striking British intellect of the middle ages".⁴ It was not until after the restoration that, through the agency of Societies in London and Oxford, the Royal Society for the promotion of Natural Science was founded (in 1662) and that, through the earlier stimulus of men like Lord Bacon (1561-1626) and Newton (1642-1727) science began to come into its own. In Great Britain, after Oxford and Cambridge, the oldest universities are in Scotland—St. Andrews (1411), Glasgow (1451), Aberdeen (1494) and Edinburgh

¹Gladstone's Romanes Lecture, 1892, pages 41-42.

²Ibid, page 43.

³G. M. Trevelyan. *A History of England*, page 183.

⁴Gladstone. Romanes Lecture, page 19.

(1583). Glasgow and Aberdeen were established by Papal Bulls, in Glasgow's case on the model of Bologna to which university Scotch students had been wont to resort.

IV. MODERN DEVELOPMENTS

The other British Universities are of modern origin compared with those hitherto mentioned. They comprise Durham (1832), London (1836),¹ Manchester (1880), Wales (1893)¹ Birmingham (1900), Liverpool (1903), Leeds (1904), Sheffield (1905), Bristol (1909), Reading (1926), Nottingham (1948) and a number of important University Colleges. The modern "pious founders", to quote the old phrase, were often local business men, who devoted and still devote enthusiastic energy to their task.

The remarkable features are firstly the extent to which university development in England has advanced since the Great Exhibition of 1851; secondly the important place that the newer universities occupy in British scientific prestige; and thirdly, the reassuring fact that the older Universities whose world-wide reputation was built on the "humanities," while retaining their status in that respect, have also achieved high distinction in science and technology.

I now come to the technical colleges.

V. THE DEVELOPMENT OF TECHNICAL COLLEGES

Their origins are attributed partly to a welfare movement by working men and partly to the initiative of a few private individuals, notably Dr. George Birkbeck and Professor Anderson. At the end of the 18th century two groups of voluntary societies emerged—mechanics' institutes, and literary and scientific societies. The first mechanics' institute was almost certainly in Birmingham with Glasgow as close second; others developed in Liverpool, Manchester, Huddersfield and London. There were also unions of mechanics' institutes in Yorkshire, Lancashire, Cheshire and London, and by the year 1851 there were 55 mechanics' institutes in England and Wales. By comparison there are now, in 1951, over 500 major establishments for instruction in technology and commerce and almost 10,000 evening institutes. Over 2 million students attend these institutions.

The 1851 Exhibition, the writings of authors such as Tyndall, Huxley and Darwin, and the many discoveries in science and technology during the 19th century, produced a climate of opinion favourable to the application of state funds to education. Evening classes were so aided, grants being paid to responsible bodies which arranged courses in science and the arts. Examinations were set by officials of the Science and Art Department of the Board of Trade established in 1853.

At the end of the 19th century, by voluntary effort very largely, the mechanics' institutes, or other similar organisations, were converted into technical colleges. Also, with supplementary state aid, many important colleges were established, such as Regent Street Polytechnic in 1881

¹Some of the constituent Colleges are of earlier date.

THE WORKER IN INDUSTRY

followed closely by six others in London and similar colleges in about 20 other important towns.¹

Those who studied at these colleges cheerfully accepted heavy programmes of evening study after a full day's labour. The system meant the survival of the fittest, for only the strongest and most resolute could stand the strain.

The Education Act of 1902 placed the control of technical education under the county and borough councils, and the first quarter of the 20th century saw a steady development of the original system : more colleges, the provision of course rather than subject instruction, a broader treatment of subjects. The financial arrangements, very broadly, were that half the cost fell on the rates and half on the exchequer. The system of external examinations then current was replaced, in 1921 and onwards, and for certain types of students only, by a typically British system of examinations, partly external partly internal, and with many special and admirable features. The awards are known as National Certificates and have a truly national currency. At the present time the numbers of entrants for National Certificate examinations in Mechanical Engineering alone exceed 20,000 ; the total for all branches of technology is much more than this.

A spurt was made in 1936 when the Board of Education announced an intended capital expenditure on technical education up to £12 million, with a similar sum to be provided by the Local Authorities. The response was very satisfactory, but World War II impeded the full implementation of the programme.

VI. THE PROFESSIONAL INSTITUTIONS

To complete the tale of scientific and technical development the important professional institutions that came into existence during the industrial expansion of the nineteenth and twentieth centuries must be mentioned.

As an illustration I take the three major Institutions of Civil Engineers, founded and incorporated by Royal Charter in 1828 ; Mechanical Engineers, founded in 1847, and incorporated in 1929 ; and Electrical Engineers founded in 1871 and incorporated in 1921. The first had on 1st July, 1951, about 18,000 members, the second 36,000 and the third 37,000. The total membership of the three is of the order of 90,000 members (corporate and non-corporate). The institutions keep their members abreast of engineering developments by lectures, discussions and monthly journals of high quality. They concern themselves with standards of professional competence and education, and co-operate with the Education Departments, and Technical Colleges, particularly on the standard of National Certificates which are taken into account in the highly valued qualifications for membership of the respective institutions.² Their mutual co-operation *inter se* is very close. There are of course corresponding institutions for many other branches of

¹The pioneer work in technical and technological education of the City & Guilds of London Institute deserve special mention.

²The qualification of these junior grades of Corporate Membership is threefold : an engineering degree or diploma, two years in a regular course of practical training and two years of responsible experience as an engineer, i.e., 7 years after obtaining the General Certificate of education at the advanced level.

science and technology with similar attributes *mutatis mutandis*, notably the Royal Institute of Chemistry with its 12,000 Fellows and Associates. Collectively these Institutions make an invaluable contribution to British science and technology.

The venerable Royal Society, the doyen and ancestor of the institutions, pursues its ever-expanding task of promoting natural science with a vigour and efficiency that the youngest might envy.

Such, broadly, were the main facilities for higher education and training of scientific and technical personnel in 1939, and I will now show how splendidly they all responded to the tremendous demands made upon them in World War II.

VII. WORLD WAR II

Between the two World Wars the Manpower Sub-Committee of the Committee of Imperial Defence had recommended as the pivot of our man-power defensive plans the setting up of a Ministry of National Service in the event of war. In August, 1939, the Ministry of Labour, the parent department of the scheme, assumed the obligations and duties of the proposed Ministry, which it discharged with conspicuous success throughout the war.¹ The pre-war preparations included :—a schedule of Reserved Occupations compiled during 1937 and 1938 to provide against the mistake in World War I of enlisting into the fighting forces skilled men essential for the construction of war material ; a Central Register of volunteers for war service by persons with technical, professional and higher administrative qualifications, brought into existence with the aid of the Royal Society, the universities and the principal technical and professional institutions ; a General Purposes Committee to control the general conduct of the Register in war time, and, through committee representatives of the various professions, to advise and assist in its use ; Joint Recruiting Boards at universities on the outbreak of war to interview undergraduates and resident university graduates under the age of 25 and to assess their suitability for training as officers and for other forms of national service.²

Those were the key features of the Ministry of Labour's scheme for higher technical personnel, and I can testify to its essential soundness, for the fates had decreed that I should be associated with it up to this very day.

When in September, 1939, the Prime Minister summoned me from the Suez Canal Company to become Minister without Portfolio (odd job man, so to speak) in the War Cabinet, one of my functions was to put science on the war map, and as a by-product of that exciting field of activity I had to assume important responsibilities in connection with higher technical and scientific manpower.

VIII. PERSONNEL FOR RADAR

The story begins at 10.30 a.m. on September 3rd, 1940, when Air Marshal Sir Philip Joubert, who was responsible in the Air Ministry for

¹For details see Ministry of Labour and National Service Report for 1939-46. Cmd. 7225/47, on which I have drawn to a considerable extent.

²Ibid, page 20.

radar organisation, blew into my office to say that radio-location, or R.D.F. as we then called it, which had been brought to light in 1935 and applied with success in a limited field, had, so to speak, "come round the corner" and that startling new developments were at hand. There were insufficient personnel within the services to supply prospective requirements and these would have to be obtained from civil life and sufficiently trained. Unless immediate drastic steps were taken the three fighting services were threatened with a critical situation. "That is just too bad," I said, "What are you doing about it?" And, as I expected, he handed the baby to the unfortunate Chancellor of the Duchy of Lancaster, as I had now become in Mr. Churchill's Government.

The responsible Minister, my colleague and friend, the deeply lamented Mr. Ernest Bevin, the Minister of Labour and National Service, whom I consulted, at once asked me to take over the job, and placed at my disposal the invaluable services of the Central (Technical and Scientific) Register.

There were two problems : the immediate deficit and the future supply of trained personnel.

The first was met, apart from the Central Register, by raiding universities, professional institutions, the B.B.C. (including Television), the Post Office, and the Dominions, especially Canada. About industry we had to be careful lest we should "kill the goose that laid the golden eggs"—namely the priceless radar apparatus. Nevertheless, the Radio-Manufacturers Association rendered invaluable help, e.g., by giving us the names and units of men who had enlisted in the forces, which, as the result of several combings, yielded considerable numbers. By these measures, and with some invaluable help from the United States, we just managed to fill the gap in the critical first year.

The long range problem was solved, with prompt assistance from the Education Departments, the Committee of Vice-Chancellors of Universities, the universities themselves, and the technical colleges, by the establishment of special courses to which a large proportion of the scientific students was diverted. Eventually over 50,000¹ men and women were selected for basic scientific instruction and passed to the fighting services, research and industry. The supervision of the scheme was undertaken by a Wireless Personnel Committee under the chairmanship of Sir Clement Jones, my trusted guide, philosopher and friend, which overcame innumerable difficulties. Thus the threatened shortage of university students was met by a system of State Bursaries to attract to the course qualified persons who became known as "Hankey Bursars". A tough struggle was to induce the fighting services to accept women recruits, who in the event proved invaluable. The difficulties in finding competent instructors and technical apparatus for 19 universities and university colleges, and 93 technical colleges were very great. For the instructors (who did a wonderful job in this new science) Summer Schools were held, twice in London,² and once at St. Andrews University, where an ingenious collection of home-made Heath Robinson contraptions was produced which had been devised by local instructors for demonstration purposes pending the provision of standardised equipment.

¹More than the Duke of Wellington's army at Waterloo.

²One of these was addressed by Sir Stafford Cripps.

IX. THE TECHNICAL PERSONNEL COMMITTEE

Scarcely was the radio personnel problem in hand before Mr. Bevin consulted me about extending to the whole range of higher technical personnel the methods that had succeeded in radar, and in August, 1941, the Technical Personnel Committee was set up with myself as Chairman and Sir Clement Jones as Deputy Chairman "to consider questions relating to the demand and supply of technical personnel and to increase the supply of certain types of scientists and engineers needed for the war effort". This time, to meet the urgent demands of the fighting services, which were mechanising themselves at a staggering rate as apparatus poured out of the factories, we had to ask industry to release hundreds of engineers at the risk of reducing output. Industrialists took the big line. They saw that their apparatus would be useless without skilled personnel for operation and maintenance, and with assistance from the Institutions of Civil, Mechanical and Electrical Engineers we managed to meet all needs.

X. ENGINEERING CADETS

I was, however, always anxious about what would happen in the event of a very long war, and in October, 1942, we introduced a scheme of engineering cadetship for youths aged 16 to 19, leading to technical commissions in the fighting services so as to enable the future needs of industry to be met without adversely affecting their capacity to equip the Armed Forces. Training was again carried out largely at technical colleges, and about 3,000 youths had been trained or accepted for training under the scheme when, in 1944, owing to the improvement in the military situation, it was suspended.

XI. IMPORTANCE OF LEADERSHIP

Before leaving our war experience it is important to note that a high proportion of those who took the courses proved acceptable to the fighting services on technical grounds. The educationalists had done their job well. What disturbed us was the number rejected by the Services—especially the Army—for want of what was termed "Officer Qualities", notwithstanding that the original Boards which "vetted" the candidates before their selection had taken that factor into account. It was extremely irritating to all concerned, and I never got to the bottom of it. But in my experience in peace and war the qualities of "leadership" and "character" are harder to find and even more important than technical capacity.

XII. POST-WAR DEVELOPMENTS

Just as technical and scientific training and education developed during the war from pre-war preparations, so post-war developments originated in demobilisation and reconstruction plans made during the war. From visits as Chairman of the Technical Personnel Committee to Radar Units and other technical establishments I had encountered among the personnel—especially the Hankey Bursars—a good deal of anxiety about their post-war future.

I therefore accepted with alacrity an invitation from Mr. Ernest Bevin early in 1943 to preside over two bodies, one known as the Committee of

Further Education and Training, the other as the Higher Appointments Committee, both intended to look after the future of those who had been torn from the careers of their choice. Sir Clement Jones was again my Vice-Chairman, and the old firm was strengthened by a number of stout people from the Ministries of Labour and Education. Both reports were completed by January, 1945.

XIII. THE FURTHER TRAINING AND EDUCATION SCHEME

The main result of the Committee on Further Education and Training was to enable the Government to advise the universities and technical colleges what to prepare for, and to make known in detail to interested personnel in the fighting services and war workers, what scientific and technical occupations were open to them in civilian life and how they should proceed in order to obtain the necessary training and education. The value of the scheme is shown by the fact that up to the 30th June, 1951, over 150,000 awards for Further Training and Education, out of 217,500 applications, were granted. Of these 150,000 awards more than 18,000 were for study of engineering, about 3,000 for general science, 5,000 for chemistry and physics, 7,500 for medicine and some 30,000 for teaching.

Provision was also made for courses at technical colleges in Business Management including sometimes practical training in a selected firm. These courses proved a great success and there is still a permanent scheme of Business Training for ex-regulars on similar lines, though for the moment it is almost suspended owing to the retention of regulars in the forces.

XIV. THE TECHNICAL AND SCIENTIFIC REGISTER

The principal result of the Higher Appointments Report was the reorganisation of the Higher Appointments Department of the Ministry of Labour and National Service and of the Technical and Scientific Register. The main functions of the latter are now :

1. To act as a voluntary employment agency.
2. To carry out surveys of manpower in the fields of technology and science, and to watch trends of supply and demand.
3. To distribute between the Services the young scientists and engineers leaving the universities who become liable for call-up under the National Service Act.

The Register deals with both unemployed and employed persons seeking alternative employment. It operates centrally from London with a staff of professionally qualified members of the professions concerned, who visit the universities to distribute scientific and engineering graduates between the Services, and take the opportunity also to give advice and assistance to ex-Service men and women and other graduates not liable for Military Service. Many graduates also visit the Register in London and receive similar assistance. Apart from their direct contacts with the Universities and with the University Appointments Boards the Register is in touch with Government Departments, industrial establishments and employers generally, and such professional agencies as the Professional Engineers Appointments Board—thus continuing and expanding contacts built up

during the war. A measure of its success is perhaps the filling of over 65,000 higher posts since 1939.

In addition, since 1949 the Register has included a special unit to handle requests for technical experts from overseas Governments, e.g., in Middle East countries, in South and South-East Asia under the Colombo plan, and international bodies such as the United Nations Agencies, notably the Technical Assistance Administration, the Food and Agriculture Organisations and U.N.E.S.C.O.

XV. THE PRESENT POSITION

Coming to the present position, since the war the Universities have made gallant efforts to increase their output of technical and scientific graduates. They have more than achieved the over-all increase of 50 per cent above the pre-war number of students—the greater part in scientific and technical subjects—envisioned by the Committee on Further Education and Training in 1944. The immediate aim recommended by the Barlow Committee on Scientific Manpower of 1946 “to double the present output giving us roughly 5,000 newly qualified scientists per annum at the earliest possible moment”¹ has been approximately attained. That is a very remarkable achievement on which both the Universities and the University Grants Committee are to be congratulated.

In the Technical Colleges also there have been notable advances since the Education Act of 1944, which, among other things, made the provision of technical education a duty of the local education authorities. Eleven Regional Advisory Councils now advise on the needs of their regions, both for university and technical college provision, thus ensuring adequacy of educational facilities without unnecessary duplication and overlapping.

Another notable advance is the establishment of National Colleges for such varied subjects as Aeronautics in all aspects, Horology, Foundry Technology, Heating and Ventilating Engineering and Refrigeration, Rubber Technology and Food Technology. More are envisaged. A sound feature is that each industry concerned is associated with the government of the college and usually with its finance.

It can be said with certainty that at no time has the country's provision for scientific and technical education been under such close and continuous review, not only by the Government but by the professional and associated bodies. That brings us to the future.

XVI. THE FUTURE

The Technical Personnel Committee

An important new factor is the reconstitution of the Technical Personnel Committee with wider terms of reference, as announced by Mr. Robens, the Minister of Labour and National Service in the House of Commons on the 26th July (Appendix). The Committee will in future deal in collaboration with the Advisory Committee on Scientific Policy, with questions relating to the overseas, as well as the home demand for scientific and technical personnel of professional or approximately professional standards.

¹Cmd. 6824/1946, para. 23.

As I am retaining the Chairmanship of the reconstituted Committee it would not be proper for me to discuss its future work, and I will limit myself to mention of a few of the larger subjects bearing on scientific and technical personnel which have lately been subjects of public discussion.

Higher Education in Technology

One of the most important and most controversial is the question of Higher Education in Technology, which raises big issues beyond the scope of this lecture. I understand, however, that the Government has had the matter under consideration for some time and that an announcement of policy may be expected before long.

Supply and Demand

Another subject of special interest to young people bent on a scientific or technological career, to their parents and to those responsible for laying out the facilities of universities and technical colleges is the extent of the prospective demand for qualified personnel in industry, the fighting services and Government at home and abroad, and the capacity of the nation's educational resources to meet the demand.

Those concerned in the next review of that subject will have the advantage of seeing how the forecasts in the twelve T.P.C. pamphlets on Supply and Demand which were published by the Ministry of Labour and National Service between November, 1949, and January, 1951, have worked out in practice. A serious difficulty in such forecasts has hitherto been the uncertainty of the international and economic outlook which has unfortunately not been cleared up by the introduction of the new factor of international rearmament.

Humanities

Yet another question for the future is the introduction of the "humanities" in the curriculum for students of science and technology, which many industrialists in Britain and America favour. It is a formidable problem for the student. A high standard in science at his secondary school is required as a condition of his acceptance by a university as a scientific student, and at the university itself he becomes so absorbed in his scientific work that he finds little time for anything else and is liable to become self-centred and narrow in outlook.

At least one famous university prescribes a qualification in one "humane" subject as necessary for a scientific degree. Possibly, however, the same object might be achieved in other ways, e.g., by laying a foundation in early life, and by bringing home to every scholar that the object of education is not so much the acquisition of knowledge as an introduction to a treasure house of reading and self-education, including the humanities, that will last a lifetime—as was dinned into me in my last year at Rugby.

Higher Direction

In conclusion I would draw attention to a new high level development in recent years resulting from the huge expansion of science and technology since the outbreak of World War II, which should not only give a fillip to the study of the humanities by the budding scientist and technologist, but should also open even wider vistas than in the past to those seeking a

scientific or technological career. I refer to the growth of great blocks of science and technology, grouped sometimes by professions, sometimes geographically, sometimes under Government, sometimes in private industries or groups of industries, and whose higher direction and co-ordination call for a very special type of scientific and technological administrator, which is not always easy to find.

Such great groups are to be found in the area of defence under the Ministry of Supply, the three Service Departments and the Home Office (Civil Defence). On the civil side of Government also there are the three huge groups of Scientific and Industrial Research, Medical Research and Agricultural Research which report to the Lord President of the Council, the new Colonial Research Service covering many branches of research and technology and extending over the whole Colonial Empire, as well as smaller research units in other Government Departments and outlying organisations.

In the Government these blocks of science are usually run by a highly qualified Chief Scientist, often with a high-powered advisory Board or Council to assist him and the Department.

The survey and co-ordination of the two main branches of Government researches is entrusted to two Committees known respectively as—for defence research, the Defence Research Policy Committee, associated with the Ministry of Defence, and, for civilian research, the Advisory Council on Scientific Policy to advise the Lord President of the Council, who is responsible for the formulation and execution of Government scientific policy. Both have up to now been presided over by that remarkable scientific administrator Sir Henry Tizard. And at the top of the pyramid are the Prime Minister and the Cabinet.

Outside the Government also there are large autonomous blocks of science maintained by Universities, the larger private industries and joint Research Associations supported by smaller industries which usually collaborate with the Department of Scientific and Industrial Research.¹

From that very condensed review it will be realised that many experts of exceptional experience and knowledge are now required for higher direction. The Director of each block or group of blocks must have a wide knowledge of several sciences, what can and what cannot be done, the personal and professional qualities of individual scientists and technologists of all kinds, and where they are to be found. He must have initiative, drive and ingenuity, and the gift of leadership, with vision to sense the wider implications of the epoch-making discoveries taking shape in so many fields. He must have a flair to appreciate how they affect national and international life and politics, as well as human relations and indeed nature itself, not only within the narrow range of our own senses, but far beyond towards the infinite.

Up to now I have not been very constructive, so to close, I will throw into the arena a new idea for consideration on the top level. Would not science and technology do well to study the experience of the Committee of Imperial Defence in setting up the Imperial Defence College, with a

¹A full account of Government Scientific Organisation in the Civilian Field, prepared for the Lord President of the Council by the Advisory Council on Scientific Policy was published in July, 1951, by His Majesty's Stationery Office. Price 1/6d. net.

view to the possible adaptation of the same system, *mutatis mutandis* to the study of science and art of higher scientific and technological administration?

For twenty-five years selected officers of the middle ranks drawn from all branches of the fighting services and civil services of Great Britain and other parts of the Commonwealth and Empire have, under experienced direction, been studying together the broadest aspects of Imperial Strategy. From this pooling of varied experience a common doctrine of co-operation in all fields and higher direction of war, has gradually emerged and has permeated the Services and the civil administration with great advantage to all concerned. The system has also crossed the Atlantic.

In science and technology there may not be so definite an objective as in the case I have mentioned but there are many problems to be solved, one or two of which I have mentioned, and there is the same need in science and technology as in the Services for a cadre of persons qualified for higher direction and top-level co-ordination. Should not aspirants to such posts have some establishment comparable to the Imperial Defence College, where they would not only obtain a more intimate knowledge of sciences and technologies other than their own, but also, following the methods of the I.D.C., meet people with totally different experience in various branches of Government and administration, finance, economics, humanities, and international affairs?

By these means there would be a double advantage: The scientists and technologists would broaden their outlook, and in doing so, would pass back a much-needed knowledge of science to Government, administration, the humanities and other branches of national life. The ideal can perhaps best be expressed by integrating science with philosophy in Plato's oft-quoted phrase:

"Until philosophers are kings, or the kings and princes of this world have the spirit and power of philosophy, and political greatness and wisdom meet in one, and those commoner natures who pursue either to the exclusion of the other are compelled to stand aside, cities will never have rest from their evils--no, nor the human race, as I believe—and then only will this our State have a possibility of life and behold the light of day".¹

Appendix I

Extract from Written Answers, House of Commons Hansard, 26th July, 1951.

TECHNICAL PERSONNEL COMMITTEE (RECONSTITUTION)

109. Major Vernon asked the Minister of Labour what special steps he is taking to review the requirements for scientists and engineers, both at home and overseas, in relation to the available supply.

¹The Republic of Plato. Jowett's translation. Book V. 473D.

Mr. Robens : Yes. It has been decided to reconstitute the Technical Personnel Committee, which, under the chairmanship of Lord Hankey, dealt so successfully with questions of scientific and technical manpower during the last war and during the immediate post-war period. The new Committee will have rather wider terms of reference than the old one. It will review the requirements for scientists and engineers at home, and especially those arising from the defence programme, in relation to the available supply. It will also consider what more can be done to meet certain important overseas needs for people of the same type.

I am happy to say that Lord Hankey has agreed to serve as Chairman of the reconstituted Committee, and the Committee's membership and full terms of reference are as follow :

TECHNICAL PERSONNEL COMMITTEE

Composition

Chairman—The Rt. Hon. Lord Hankey, G.C.B., G.C.M.G., G.C.V.O.

Members nominated by the Federation of British Industries :

Sir Arthur Fleming, C.B.E., D.Eng., M.Sc., F.C.G.I.

Sir Wallace Akers, C.B.E., F.R.I.C., Hon.D.Sc.

Captain A. M. Holbein, C.B.E., F.C.G.I.

Representative of the Universities : Sir Edward Appleton, C.B.E., K.C.B., F.R.S.

Chairman of the University Grants Committee : Sir Arthur Trueman, F.R.S., D.Sc.Lond.

Deputy Chairman of the Advisory Council on Scientific Policy—(nominated by Lord President) : Professor S. Zuckerman, C.B., F.R.S.

Treasury : Mr. S. L. Lees.

Foreign Office : Mr. E. A. Berthoud, C.M.G.

Colonial Office : Mr. R. A. Whittle, M.C.

Board of Trade : Mr. S. A. ff. Dakin.

Commonwealth Relations Office : Mr. A. C. B. Symon, C.M.G., O.B.E.

Ministry of Labour : Mr. H. M. D. Parker, C.B.E.

Ministry of Supply : Mr. W. D. Wilkinson, C.B., C.B.E., D.S.O., M.C.

Lord President's Office : Mr. E. D. T. Jourdain.

The Secretary will be Mr. A. J. S. James, Ministry of Labour and National Service.

Terms of Reference

- (1) To consider, make recommendations and deal with questions relating to the home and overseas demand for the available supply of scientific and technical personnel of professional or approximately professional standards, including the making of recommendations on its economic use and the need for increasing the available supply.

(2) In connection with the overseas demand for such personnel :

- (a) To make recommendations upon appropriate steps to promote the recruitment from the United Kingdom of persons required to assist the economic development of under-developed countries.
- (b) To consider any special steps which are required to provide opportunities for training in the United Kingdom of persons from under-developed countries.

The Committee will be empowered to invite representatives from other Government Departments or outside interests to be present when matters of concern to them are being discussed.

Problems of Wages Policy

by Mr. C. W. GUILLEBAUD, C.B.E.

Thursday, 13th September, 1951

MY LECTURE would perhaps be more appropriately entitled "Problems of Wages and Wages Policy"; for when I came to prepare it, it seemed desirable to discuss in the first instance the general economic background of wage determination, and then to go on to deal with wages policy, especially in its present setting.

I start with the obvious truth that wages, as a category of earnings, are paid out of the national income of which they form part, and that their magnitude depends above all on the size of the national income.

In normal conditions, when the general level of money wages is rising in response to an increase in the national income as a whole, there will usually be an increase in the aggregate real incomes of the wage-earning class. But under certain circumstances of full employment, of which the present time affords a conspicuous example, general rises in money wages may not lead to larger real incomes in the aggregate. For total real earnings depend upon the supply of what has conveniently been termed wage-goods —i.e. the consumption goods of all kinds on which wage-earners spend their money incomes. If the supply of wage-goods is rigid, or at least increases more slowly than money incomes, then rises in the latter merely increase the existing demand for wage-goods, and raise their prices after a certain time-lag, leaving the workers little or no better off than they were formerly. But what then determines the supply of wage-goods? It depends on the size and efficiency of the consumption goods industries (the supply of labour in those industries being an important factor); on the supply of imported foodstuffs and raw materials, which in turn is related to the efficiency of our export industries and to the terms of trade; and on the volume of consumption goods which we have to export and which are therefore not available for the home market.

The present re-armament campaign is likely to be to some extent at the expense of exports and will tend therefore to diminish the supply of wage-goods; on the other hand it will increase the total of money incomes competing for the acquisition of wage-goods and will tend to drive up their prices.

One very remarkable fact about the working of the economic system as a whole—though the precise reasons are not yet fully understood by economists—is the comparative stability through time of the proportion of the national income which goes to labour (apart from redistribution through taxation). In all modern developed countries such as Great Britain, the U.S.A., the British Dominions, etc., for which we have figures the proportion is roughly similar, and for each country it varies astonishingly little from decade to decade, and even (though the evidence here is more conflicting) from the top of the boom to the bottom of the depression. The percentage for wages and salaries of the total national income ranges in the different countries from about 55 per cent to 65 per cent. If we compare the U.S.A. in 1929 and 1947 (when the percentage of unemployment was

about the same in both years) we find that, although the national income had nearly trebled in 1947 and the New Deal policy and the greatly increased strength of the trade unions and large overtime earnings, had raised average money hourly earnings by 116 per cent and real average hourly earnings by 66 per cent, the proportion of wages and salaries to the national income remained approximately the same, in the neighbourhood of 60 per cent. In this country the proportion of wages and salaries in 1938 was about 60 per cent of the national income, and in 1950 about 65 per cent, but the rise in this latter case is due largely to such causes as the very high level of employment, and the existence of price control, subsidies, and rationing, etc.; and I would hazard the opinion that it may turn out to be only a short-run increase, and one that cannot be maintained permanently. I might add that wages alone (round about 40 per cent normally of the national income) maintain the same sort of stability as wages and salaries taken together.

It follows from this firstly, and most importantly, that wage-earners stand to gain most from an increase in the total size of the real national income, secondly, that trade union organisation would appear to be unable through time to alter appreciably the direct share that goes to labour as a whole. And thirdly, that where individual trade unions are particularly successful in improving the relative position of their members in the general wage hierarchy, this is likely to be mainly at the expense of other sections of the wage-earning class, especially if there is any restriction of entry into the industry, whether caused by the unions themselves or for other reasons, and also if the supply of wage-goods is rigid and inelastic. It was considerations of this order that led Lord Keynes in the inter-war period to suggest that there might be more scope at that time for improving the condition of the wage-earners as a class by an extension of social services and by re-distributive taxation, than by attempting, by an upward pressure on wages, to alter the initial share of labour in the national income.

I turn now to consider relative wages.

As in the case of the other factors of production, wages are paid out of the sale proceeds of the product of industry, except in the rare cases where there is a State subsidy. Hence the demand for labour in a given industry is ultimately derived from the demand for the product, and much will depend upon the elasticity of demand for the product—i.e. the response of demand to changes in price. An interesting recent American study of relative wages in a number of different countries shows that wages tend to be low in those industries in each country which export a large proportion of their products; for employers in these industries are likely to be much more sensitive to wage increases and to resist them more strongly than when the demand comes from the national and often protected market.

It is this sort of consideration that is relevant when it is said that wages must be related to what the industry can bear. There is of course some latitude in the division of the product of the industry between profits and wages, but it is not a very wide latitude; partly because profits as a rule are small quantitatively in comparison with wages; partly because a considerable part of gross profits is needed in order to maintain and increase the supply of capital, on which the productivity of labour so greatly depends;

and partly because increases in wages in a particular industry, which were at the expense of profits, would tend to discourage investment in that industry and so to react unfavourably in due course upon the demand for labour in it.

While it is true of wages, as of all other prices, that other things being equal, a rise in wages diminishes the demand for labour, and vice versa for a fall in wages, this does not necessarily hold where all wages are concerned. For a rise in all wages may be associated with a rise in prices and in incomes in general, with the result that there is no decline in the value of the marginal net product of labour in real terms—the goods sold at the higher prices being bought out of the larger money incomes. This of course is likely to be an inflationary condition—and it is one that is liable in course of time to cause repercussions in the field of monetary policy, especially if it results in the country finding itself in difficulties over its balance of payments with other countries. I might add that if the present inflationary trend continues in this country we are going to be faced eventually by a most serious balance of payments problem. At the moment, the fact that most other countries are also in the throes of inflation helps to preserve our balance of payments.

Turning now to the supply side of labour in particular occupations, this is influenced, firstly, by the total of what Marshall called the net advantages of the occupation. There are perhaps half a dozen or so great non-competing groups of occupations, i.e. groups between which there is little or no mobility. But within each particular group, where there is mobility the tendency exists for wages to form the balancing factor, in the sense that the lower the net advantages in comparison with other occupations the higher will tend to be the money wage rate. These non-pecuniary net advantages or disadvantages depend for their influence essentially upon the subjective appreciation of them by the workers, and on the extent to which the conditions of the labour market make it possible for workers to exercise effectively their preferences between different occupations. The war and the very high level of employment have had a revolutionary effect upon net advantages and so upon relative wages. Thus the railways have lost their pre-war advantage of enjoying stability of employment in contrast to the instability of employment which characterised most other industries, and it is now more difficult for them to attract and keep their labour. Textile operatives can now find pleasanter jobs in light engineering ; while that lowly but important category of workers the charwoman or cleaner gets a higher hourly rate than that of a large proportion of male unskilled labour.

Secondly, the supply of labour to a given occupation depends upon the level of wages and earnings prevailing there in comparison with other industries. This is obviously one of the most important facts which determines for the employer the wages that he must pay in order to attract and keep his labour.

Here again the war, and the over-full employment which has accompanied and followed it, have wrought tremendous changes. I will refer only to one of the most important of these—the rise in wages of the agricultural labourer. Before the war, in rural England, all that was necessary in the case

of the country baker or any other local employment (e.g. the country railway porter) was a wage just fractionally above that of the agricultural worker. Today, with a minimum wage of 100/- in agriculture (108/- in November, 1951), the whole wages structure throughout the country has been most drastically affected.

In the big towns and the great industrial districts, especially in the North West, many employers are paying wages well in excess of trade union standard rates—a fact which exercises a continuous upward pull on wages all round. In assessing the strength of the forces making for rising wages at the present time, I would rate the pushing up of wages by employers competing with one another for labour as only second in importance to the demands of the trade unions themselves. It is in no small measure the employers who have undermined the standard rates and made further wage claims from the unions almost inevitable.

I would add that at any given moment there is a certain wage structure throughout a country, which itself is largely the product of past historical and economic forces. These established differentials tend to assume great importance in the workers' minds, and violent changes in some of them such as have taken place recently have wide repercussions elsewhere. I am reminded of a dictum of a former Deputy Secretary of the Ministry of Labour—Mr. Humbert Wolfe : "With wages it is like war. Once you start you can set no limits to your journey. To touch the main body of wages at any point is ultimately to touch it all".

Thirdly, the supply of labour must not be conceived as something automatically determined by impersonal economic forces. There is a supply price of labour, and this supply price can be affected by the action of the State through such bodies as Wages Councils, or by trade unions. Wage determination, when there are trade unions and there is collective bargaining, is likely to be different from what it would have been in the absence of collective bargaining, and much will turn on the skill in negotiation and the personalities of the leaders of the two sides, as well as on all the other complex factors which influence bargaining power. Under certain conditions, such as exist today, the mere fact of collective bargaining strengthens the hand of labour, because the elasticity of demand for the products of a single employer in a multifirm industry is likely to be greater than for the products of the industry as a whole. Employers collectively are less resistant to wage increases, which they know all their competitors will also have to pay, and which can be added on to the price of what they are all selling.

The whole notion of a supply price of labour is a somewhat nebulous one—it ties up closely with the standard of living and therefore with the cost of living—it relates to a standard which labour would like to maintain and, of course, through time improve on. But trade unions do find themselves constrained despite all their desires to lower their supply price if there is a large decline in the demand for what they are producing ; which explains why in the inter-war years it was precisely in many of the industries in which trade unions were strongest and longest established that wages were lowest, for these were the industries that were hardest hit by the depression. I would also remind you of what I said earlier, that although trade unions can and do have a powerful effect upon relative wages, the

available evidence would seem to show that in the long run they are unable to affect materially the share of the national income that is received initially by labour as a whole, nor can they, by securing general increases in money wages, increase real wages *unless* the higher money wages are accompanied by an increased output of wage-goods.

Fourthly, the supply of labour is by no means the same thing as the supply of workers. Account has to be taken of their skill and training and of the number of hours they work, of the efficiency of the wage system in calling forth and rewarding effort, and very importantly, of the state of industrial relations.

In concluding this part of my lecture I wish to state emphatically that there is no such thing as an economic theory of money wages, which declares that they are what they are because of the blind and impersonal working of economic forces, and that they could not be anything different. The so-called marginal productivity theory of wages has often been misapplied in this sense.

What one can say is that money wages as a whole, as also the structure of relative wages in different occupations, are determined by the combined action and inter-action of all the manifold and intricate forces which operate on the side of the demand for labour and of the supply of labour, always bearing in mind that that often incalculable factor—the human element—plays a very considerable rôle in the working of these forces.

In the real world wages are a most important part of the whole dynamic process of the economy, and assumptions of static equilibrium have to be used with very great caution. It is often said that wages are "unfair" and that there is exploitation if the workers in a given industry are paid less than the value of their marginal net product in other industries; and in most people's minds the word "unfair" would seem to carry with it the connotation "undesirable". But in the real world of change and movement it is essential that a decline in the demand for the product of an industry should be reflected in a relative decline in their wages, while expanding industries ought for a while to have "unfairly" high wages. The essential rôle of changes in relative wages is to induce labour voluntarily to shift from one industry to another in accordance with the changing needs of the economy. The only alternative to this is the authoritarian direction of labour.

Finally, I would point out that, whereas for the worker wages are an income-producing price paid for his labour, for the employer wages are a part of his prime costs of production. These two widely different aspects from which wages are regarded by the two parties to the wage contract explain a good deal of the divergent standpoints which they bring with them when they sit round the table to negotiate a wage settlement. Each side feels that its own case is securely based, and finds it hard to understand the apparent inability of the other side to give due weight to it. But these two aspects of wages—as incomes and also as costs—assume their greatest importance when it comes to the level of money wages as a whole, for wages constitute such a large proportion of the total amount of personal incomes, that changes in this volume have a big effect on the whole economy. As costs they enter directly into prices and as incomes they swell or diminish the total volume of monetary demand.

It is against this background of general economic reasoning that I want to discuss questions of wages policy, and I propose to lead up to this by saying something about State intervention in the wage contract.

Between the 16th and 18th centuries Justices of the Peace had powers to fix maximum wages, though these were not very widely exercised. These powers were swept away with the coming of the Industrial Revolution ; and the last vestiges disappeared when the Spitalfields Act was repealed in 1824, against the wishes of a majority of the workers and many of the employers in the declining silk industry of London, who would have liked the wage-fixing powers retained in the form of *minimum* wages.

From then on, apart from the Truck Acts, the State stood entirely aloof from the wage contract until 1891, when the House of Commons passed the Fair Wages Resolution requiring Government contractors to pay standard wages to their work-people as a condition of getting Government contracts. Standard wages were later defined as wages agreed upon between employers and trade unions, or in the absence of such agreements, wages paid by "good" employers.

Then in 1909, after the public conscience had long been troubled by the intractable problem of sweated labour, the first experimental Trade Boards Act was passed establishing statutory wage-fixing machinery in four trades in which sweated conditions prevailed. These Boards, composed of equal numbers of employers and workers with three independent members, were given power to fix minimum wages, which were legally enforceable at criminal law. The experiment proved a success, its scope was greatly extended until today there are 65 Wages Councils (fundamentally the old Trade Boards re-christened) which cover more than 3 million workers, apart from the Agricultural Wages Board. They include such major occupations as road haulage, baking, catering, the clothing industries and the bulk of the retail distributive trades.

It can then be said that, through this machinery, the State now plays an important rôle in wage determination in this country.

But it is vital to the proper understanding of this rôle to note that the State has nowhere in its legislation laid down any rules or principles to which the Wages Councils must conform. Each Council is sovereign and autonomous in its own sphere, though it is true that its wage determinations must be ratified and confirmed by the Minister of Labour before they can be legally enforceable, and he can refer them back to the Council for further consideration. Apart from reasons of a technical or legal nature, he hardly ever refers back a wage determination on grounds of public policy ; and in the very few cases where this has happened in recent years, in circumstances which I shall mention in a moment, he has never withheld his ratification if the Council adhered to its previous decision. At the same time, the knowledge that this power exists and that, if exercised, it will at least involve considerable delay, does exert a certain restraining influence on the Wages Councils.

There are two other points, relating to the position of the independent members of the Councils, to which I would refer briefly. In the first place, it is true that they are appointed by the Minister of Labour, but once appointed and holding office they are not subordinate to the Minister in

any way, and neither he nor his officials ever advise them as to their proper course of action in the public interest.

Secondly, they are not arbitrators, though they can give a casting vote in favour of one side or the other. But if the two sides are agreed the independent members are powerless to intervene, even if they disapprove of the proposed action.

I have no time to discuss the conciliation and arbitration machinery provided by the State. All I would say is that here too, in the case of the Industrial Court and the National Arbitration Tribunal, the State has laid down no rules or principles to guide them in reaching their conclusions.

The one outstanding example of an attempt by the State to influence wages policy in this country was the issue of the famous Government White Paper on Personal Incomes, Costs and Prices in February, 1948. This statement of policy, which was brought to the attention of all wage negotiating bodies (not only to the Wages Councils) laid down as an essential principle : "that there should be no further general increase in the level of personal incomes without at least a corresponding increase in the volume of production". At the same time it recognised that "there may well be cases in which increases in wages or salaries would be justified from a national point of view, for example, where it is essential in the national interest to man up a particular undermanned industry and it is clear that only an increase in wages will attract the necessary labour". It added however that "each claim for an increase in wages and salaries must be considered on its national merits and not on the basis of maintaining a former relativity between different occupations and industries".

At the same time the Government undertook to take what steps it could to restrict price increases and to keep profits within bounds. The Trade Union Congress endorsed the general policy of wage stabilisation on condition that the Government carried through its policy of preventing increases in prices and profits.

It is important to place in its historical setting this direct incursion of the State into wages policy, which represented so great a departure from anything that had been done in the past. I would remind you that the big American post-war loan to Britain had run out ; there were indications that the sellers' market for exports was coming to an end ; our balance of payments position appeared to be most serious ; and it seemed quite essential that costs in the export industries should not be driven up so high as to prevent our competing in foreign markets, especially in the dollar countries. In other words, it was a *crisis* situation.

For 18 months to two years the policy was in fact remarkably successful, it was loyally backed by the T.U.C. in its *collective* capacity ; and it did exercise a most important restraining influence on wage increases—much greater than many people realised at the time. Average weekly earnings between April, 1947, and April, 1948, increased by 11/6d., but between April, 1948, and April, 1949, by 5/4d. and between April, 1949, and April, 1950, by not more than 4/9d.

In time, however, it became increasingly difficult to hold the line. Although the rise in prices was checked it did not cease, nor, in the face of

a continuously expanding monetary demand, did or could profits fail to grow. Marshall Aid came to the rescue of our balance of payments, both by providing us with dollars and by increasing the productivity and purchasing power of the continental countries. Finally, despite the official sponsoring of wage restraint by the T.U.C., some unions did get relatively substantial increases in wages, which naturally made the other unions and their members increasingly restive; at the same time many employers were bidding against one another for the scarce supplies of labour.

The real turning point came I think with the devaluation of the pound sterling in September, 1949, for it then became clear that the future trend of prices and of the cost of living must be upwards. Although a conference of trade union executives in January, 1950, again reaffirmed the official policy of wage stability, the end was already in sight. One trade union conference after another during the first six months of 1950 rejected the policy, and the T.U.C., in imminent danger of being repudiated by its own constituent membership and of losing all leadership over the trade union movement, formally abandoned the policy on the 28th June, 1950. While still emphasising the need for the continuance of restraint, it recognised "that there must be greater flexibility of wage movements in future". It added, however, very significantly that "It is firmly convinced that there is no formula that can be devised as to how this flexibility can operate". It is an historical coincidence that this statement should have been made only three days after the outbreak of the Korean War on 25th June, 1950. But it is in fact the Korean War, and the increased tension with Russia, which are overwhelmingly responsible for the economic situation of this country and of the whole Western World, now and in the near future. All the inflationary tendencies, which might otherwise have abated, have been strengthened and reinforced. American stockpiling and the vast production drive there have forced up the prices of raw materials and foodstuffs to the great detriment of our terms of trade; while in this country, on top of an already excessive level of government spending and aggregate investment, there has been superimposed a large additional programme of rearmament. All the phenomena of inflation are with us—rising prices, rising profits, and rising wages—and it is not easy to see how or where a halt can be called, so long as the underlying causes continue as they are at present. Especially moreover since the beginning of 1951, wages have been rising to an extent which is causing widespread concern.

In these circumstances it is not surprising that there should be talk of the need for some kind of planned or centralised wages policy which would take the place of the present completely haphazard and chaotic practice, where no attempt is being made to relate wage claims to what is desirable in the national interest.

From the economic point of view the most interesting and authoritative of the proposals that have been put forward is that, on the basis of an estimate of the national income for the coming year, and of the share in it that could be made available for wages without adding to inflationary pressure, an aggregate wage budget should be drawn up for the succeeding 12 months. Let us assume for the moment (and it is a very big assumption indeed) that this is agreed upon. Wages are running at a total of say £5,000

million, salaries at £3,000 million, and there is a sum of let us say £300 million in all that can be used for granting wage and salary *increases* during the coming 12 months. Some centralised machinery would then have to be responsible for allocating this total sum amongst the various claimants in accordance with what is equitable and in the national interest.

Apart from the question of the precise nature of this central wage-allocating authority, which I will come back to in a moment, the formidable difficulty lies in the absence of any criteria which would provide a secure basis on which to found a decision in the great majority of cases, and here I find myself in whole-hearted agreement with the statement I have quoted from the Trade Union Congress.

Increase in productivity per head might seem an obvious criterion. But in a great many occupations it is not readily measurable, yet those employed there may regard themselves for other reasons as equally entitled to an increase. The rise in productivity may also be mainly due to a larger amount of capital per worker. Again, increases in productivity might well be greatest in industries, such as the armament industries, which contribute nothing to the supply of wage-goods on which real wages depend, and where in any case through piece-work, production bonuses, etc., a larger output is automatically accompanied by higher earnings. The productivity criterion also does nothing to solve the difficulty of differentials within an industry—the claims of the lower paid workers on the ground that they need the money more and are hardest hit by the rise in the cost of living, and the claims of the skilled workers on the ground that their greater skill and responsibility are not being adequately recognised in the wage structure.

Capacity to pay is certainly one of the relevant criteria in wage determination in normal times, though even then it requires to be carefully handled. But in a time of inflationary pressure it could be extraordinarily misleading. High gross profits are an inevitable concomitant of inflation, and I could not imagine a wages policy being usefully related to them. Moreover, capacity to pay might well be least in some of the export industries where more labour is most needed.

The condition of being undermanned as a justification for higher wages would not take one far. Coal, certain textiles and perhaps agriculture would, I suppose, have a strong case. But for the rest, nearly all industries are short of labour, especially of juveniles, and working conditions are often more important than relative wages, unless rates are pushed up very high indeed.

Doubtless it would be possible on paper, to work out some sort of combined index of relative merit, ranging in order all the candidates for wage increases. But who is the superman to whom this task is to be entrusted and who is going to acknowledge the justice of an evaluation which puts his particular industry low down on the list? If national importance is going to play an important rôle, baking and the railways would stand pretty high on the list, and I would not like to have to explain and defend the reasons why other industries were accorded (as on other grounds they might be) more marks than are given to baking and railways.

If I am right in holding, as I do, that these are no criteria which would not be, or appear to be, in a large measure arbitrary, and incapable of

explanation and justification to the ordinary (even skilled) wage-earner, that alone would seem to rule out of court an official wages policy on the lines I have here been discussing.

But any form of centralised or planned wages policy must imply some central body in whose hands the duty of making decisions or recommendations rests—and in this country (I would emphasise the words "in *this* country") that raises very great, it might almost seem insuperable difficulties, at any rate at the present time.

I rule out the Government for what would appear to me to be obvious reasons.

I find it very hard to believe that the Trade Union Congress, either with or without expert economic assistance and advice, would be acceptable to the trade unions, whose leaders depend for their prestige and their membership so largely upon their bargaining powers. In practice, moreover, any centralisation of wage policy in peace time (including in that term the cold war) would mean handing over the effective leadership of labour in many industries or sections of industries to the communists, who would seize the opportunity with open arms. Apart from the T.U.C., who surely neither could nor would assume the required rôle, is there any other conceivable authority? I cannot see one.

And yet if I were to leave it there, on this purely negative note, I would be in danger of misleading you, for if we look for a moment abroad, at certain foreign countries, we do find arrangements which have some claim to be regarded as a sort of wages policy.

In the Scandinavian countries there is a tradition of rather close co-operation between the central organisations of both employers and trade unions; and these central bodies have much more authority over their members than is the case in this country. It has been possible therefore to control and co-ordinate wage increases, in a rough and ready sort of way, which at any rate works a good deal better than the type of competitive increases which we see here, which were only temporarily held in check by the White Paper, and which are now in full swing again.

In Holland the general level of wages throughout the country is directly fixed under the aegis of the State, and there is a very interesting system of job evaluation by points to determine the wages of the different categories of labour within each industry.

In the United States wages were restrained to a considerable extent during the war by a Government Wage Stabilisation Board, which has now been resuscitated to deal with wages in the armaments and other industries affecting the national defence. This affords a peculiarly interesting example of the different attitudes of British and American labour as to what constitutes freedom in the economic sphere. In the United States the unions would not hear of the direction of labour during the war, but they accepted the principle of wage stabilisation. Here in Great Britain we rejected wage stabilisation, but accepted the direction of labour.

When therefore I reach a negative conclusion as to the feasibility of adopting a centrally controlled wages policy in this country, it is not because I regard it as inherently impossible, provided the degree of inflation is not

too great—the example of other countries shows that it is possible to go a considerable distance in this direction—but because I cannot in any near future see much likelihood of the people of this country, whether employers, trade union officials or individual workers, being willing to allow such a system to be operated. Past traditions, the institutional framework, and the whole climate of opinion here, are against it.

I would venture, however, to make one practical suggestion, which is that, so long any rate as present conditions continue, the Government should publish annually an estimate of the amount by which, in the opinion of their statistical experts, the total sum of wages and salaries could rise during the ensuing twelve months without adding to inflationary pressure. This information would then be at the disposal of employers and trade unions alike, and might well exert some influence upon their policy. If, however, it was considered that the data for making such an estimate in advance were altogether too uncertain, figures might still be given in respect of the preceding twelve months, which would show at least what had in fact taken place in this section of our national economy when brought into conjunction with the output and supply of wage-goods.

I can see no reason, moreover, why a rough and ready system somewhat on the Scandinavian lines, could not operate reasonably successfully in this country. But it would only work if the great majority of those concerned realized its desirability and were determined to make it work. Above all, it would have to be clearly recognised that it is beyond the wit of man to devise scientifically chosen rules, based upon clear-cut economic principles, in accordance with which a wages policy could be carried out. I feel tempted to suggest that this need not prove an insuperable objection in the case of so empirically-minded a people as the English, though I must admit that the Scots might be a tougher proposition.

So long as prices and profits continue to increase, it is of course senseless even to talk of a wages policy, if by that is meant a policy of wage stabilisation. You cannot stabilize wages and salaries if other categories of incomes increase as they must do under inflation; though it is essential to recognise that wage and salary increases, if they go beyond a certain amount, become an integral part of the inflationary process itself. Inflation *cannot* cease if wages keep on being pushed up beyond physical productivity—i.e. if money wages (minus wage-earners' taxes and savings) rise in excess of the increase in available wage-goods. But to introduce some sort of order and discipline into the process of collective bargaining is something that should not be beyond the statesmanship of organised employers and workers in this country.

Even without the adoption of any new system at all, I would like to see the central organisations of employers in this country bringing pressure to bear upon their members to resist excessive claims for wages, and the giving of wage increases in order to attract labour away from other firms; and, very importantly, that there should be a common inter-industry policy with regard to the conditions of labour other than wages—such matters as holidays with pay, hours of work, overtime rates, etc.

And I would like to see those trade unions, whose members are already high up in the wage and earnings scale, exercising a greater moderation in

the amount and frequency of their wage demands. It is the big jumps in a few industries which do the harm, and the pushing up of wages where earnings are already high relatively to other industries. I know that many trade union leaders are far from happy about the present situation, and with few exceptions their influence has been steadily exerted in the direction of moderation. But they are the servants of their members, and there are limits to the extent to which they can hold their own people back.

*In the light of the realities of our economic position I can only regard it as unfortunate that the Trade Union Congress in its Annual Report published in August, 1951, after recognising that the re-armament programme must involve, for the time being, a fall in the standard of living of the community, and stating with some logical inconsistency that, "It is apparent that in the present situation trade unions must endeavour to maintain the real wages of their members by demanding wage increases", should go on to say: "Some favourably placed sections may be able to achieve this, but it is not likely to be possible for the workers as a whole". What the T.U.C. apparently fails to realise is that the success of these "favourably placed sections" in maintaining their standard of living must be predominantly at the expense of other sections of the wage- and salary-earning classes; for if the former, the "favourably placed" get a larger share of a *declining* volume of wage-goods, there must be less left over for all the remainder, including the whole of the much-to-be-pitied class of small pensioners.*

May I conclude by putting my view on this whole matter in a nut-shell.

So long as inflation continues, a centralised policy of wage stabilisation is impossible; as soon as inflation ceases it will be unnecessary.

The Contribution of the I.L.O.

by Sir FREDERICK LEGGETT, K.B.E., C.B.

Wednesday, 19th September, 1951

I SPEAK on the subject of the International Labour Organisation, as one who was British Government Delegate for 14 years, and who has since had actual experience of its activities in various countries.

Throughout its history the I.L.O. has produced a vast amount of reading matter on its operations, and, in its Reports and publications, there is available to those who are interested a most valuable and comprehensive record of action and thought in regard to industrial and labour matters over the last 32 years. Unfortunately, however, the Organisation has not yet succeeded in producing any publication of a sufficiently popular character to provide ordinary people with even an interest in its work and activities, and it is still the case that only a very small proportion of our people have any actual knowledge of or interest in it. Over the years it has been saddening to see even Members of Parliament hotly debating Conventions which they have obviously never read and the Organisation has suffered greatly from this mixture of ignorance and political partisanship.

I do not propose in the time available to me to attempt to give a detailed account of the Organisation's work. I can only give a general indication of its direction and its potentialities.

The Ministry of Labour and National Service has special reason to be proud of the fact that the plan for the International Labour Organisation, which has proved to be the most firmly based of the organs of international collaboration, was conceived in all the detail of its constitution inside the Ministry. In 1917 trade unions in the Allied countries had attained a greater measure of recognition than ever before and wished to consolidate their gains by provisions in the Peace Treaty regulating the working day and other labour conditions. With the experience of the International Association for Labour Legislation, before him, Mr. Edward Phelan (late Director-General of the I.L.O.) who was in the Intelligence Division of the Ministry under the late Sir Harold Butler, was mainly responsible for the British plan. He realised the difficulty of getting agreement on such provisions by diplomatic discussion and of amending them when embodied in Treaties and assuring their enforcement. The plan, therefore, provided for the discussion and adoption of Draft Conventions and Recommendations by International Labour Conferences and for the freedom of each country to accept them or not. The American Federation of Labour, which disliked the regulation of labour conditions by legislation, proposed periodical international labour congresses to bring pressure to bear on Governments, but this was also regarded as unlikely to be effective. Finally, the merits of the plan and the pertinacity of Mr. George N. Barnes, War Cabinet leader of the British Delegation, secured its acceptance by the Labour Commission of the Paris Conference presided over by Mr. Samuel Gompers, President of the A.F.L., and its inclusion as Part XIII of the Versailles Treaty. As a concession to Labour representatives, who had desired immediate

decisions on certain labour conditions, a list of objectives was included in the Preamble of the Constitution of the I.L.O. in the Treaty.

One of the reasons for the firm position of the I.L.O. is that it was a natural development of previous international movements. In 1818 Robert Owen circulated a memorandum pointing out that labour problems had no national boundary lines and hinting at labour legislation on international lines. Daniel Legrand, whose bust is to be seen at the International Labour Office, devoted years of his life in the middle of the 19th century to endeavouring to get the British, French and Prussian Governments to enact, as he phrased it, "an international law to protect the working classes against premature and excessive labour". After some abortive action by Governments the International Association for Labour Legislation was constituted by private individuals, in Paris in 1900, and an office was set up known as the International Labour Office. As a result two Conventions, one on the employment of women at night and the other on the use of white phosphorus in the manufacture of matches were adopted by many Governments in 1906. The I.L.O. was thus founded on a basis of experience and it had the advantage over many years of the help of prominent personalities who had been active in the work of the International Association, such as Sir Malcolm Delevigne of this country, M. Fontaine of France, who was a Chairman of the Governing Body for 12 years, and M. Mahaim of Belgium. It had been learned that purely unofficial action without adequate funds was unsatisfactory and that professional diplomats having no contact with those actually engaged in industry were too remote from the facts to make much progress.

The first Director, M. Albert Thomas, from the commencement of his work to his death in 1932, showed great energy and initiative and it was largely due to him that the I.L.O. so soon became a live and aggressive organisation. He deliberately set a fast pace. To quote his own words :

"At the time of the Treaty we were swept forward on a great tide of moral and social forces. Immediately after the end of the war, and indeed during its concluding stages, there was a great movement towards union among the workers in all industrial countries. With one accord, in their hundreds of thousands, in their millions, moved by a sense of unrest and a great impulse of solidarity, they all at once united in powerful organisations. It was they who brought pressure to bear on the Governments : and that pressure was the stronger because it corresponded to imperative necessities and to the revolutions which had taken place in the defeated countries. The workers were urging us to make the International Labour Organisation such a new instrument of regeneration—I am almost tempted to say such an instrument of social revolution—as they no doubt had in mind."

I quote these words because it became the established basis of discussions and policy at the I.L.O. that employers and governments were always to be regarded as hostile to progress and that the Office and the Workers' representatives were allies in a fight against them. Looking back to the pre-war years it is possible to say that, while it placed a strain on the loyalty not only of employers but also on the most progressive and well-intentioned Governments, this aggressive policy established the I.L.O. as a constitutional and democratic means of moving towards improved standards and thereby

assisted workers' organisations to stand against more extreme courses and persons. As the years went by, however, it led to an excessive confidence on the part of officials of the I.L.O. in their ability to formulate detailed regulations of industrial conditions and informed criticism was largely wasted by the zeal with which workers' representatives defended the Office Texts, regarding all attempts to bring them into accord with the actual facts of industry as hostile and reactionary. It is always a danger in international organisations that there will be a tendency to over-confidence on the part of the officials in their own capacity to formulate proposals to regulate the lives of others, and too little a readiness to have regard soon enough to the views of those concerned. As I shall indicate later the I.L.O. has greatly changed its method of operation in a way that brings the general body of those concerned in the various countries into active co-operation and this development will doubtless immeasurably increase the contribution it will make to future progress.

The policy in the past was also plainly one based on the trade union demands in advanced Western Countries and on the continental love of laws and decrees. It has taken a long time to show that the policies put forward in the '20's and '30's even when widely adopted were only a partial answer to the problems which beset even advanced countries. The representatives of countries in which conditions were primitive, covering the greater part of the population of the world, saw little connection between their needs and the provisions of the various Conventions and Recommendations which were the subject of such impassioned debates at Geneva. It was, however, politically expedient to avoid any appearance of resistance to progress in the improvement of industrial conditions and many supporting votes were cast without any hope that the provisions could be applied. Conventions were even ratified without any effective following action being taken. By the foresight, however, of those who drafted the Constitution of the I.L.O., the position was safeguarded by the wise provision which did not make Conventions voted at Geneva automatically binding on the Member countries. It was provided that, while each country was bound to bring the Convention or Recommendation before its Legislating Authority within 18 months, that Authority was free to accept it or not. International action is often discussed in terms of supra-national authorities, but, in these days, when nationalistic feelings are a more powerful factor than ever, the I.L.O. stands as a clear example of the fact that international action is made effective on a continuing basis only by the co-operation and agreement of individual nations exercising an unfettered national sovereignty.

The International Labour Organisation probably owes its survival and strong position, when other international organisations have failed, to two elements in its constitution :

- (a) the preservation of the sovereignty of each Member State ;
- (b) its tripartite character which gives employers' and workers' representatives as well as those of Governments an effective place in its discussions and decisions.

It is important to note, as another factor in the continued progress in which the I.L.O. has certainly played a great part and which has maintained its influence and status, that countries which could not implement Con-

so much order to the proceedings. It was unfortunate in that some of these personalities appeared to make the I.L.O. a forum only for themselves. The days are long past, however, when the speech of M. Jouhaux on the Director's Report was a heralded event in Geneva and a crowded assembly listened to oratory devastating to the characters of Governments and employers. It is a tribute to the wider spread authority among the representatives and the more realistic and objective nature of the discussions that no country or individual occupies such a position. It was always a weakness, however, that the continuity of prominent trade union and employer representatives prevented those who were closest to the rank and file to take part in, or to have direct knowledge of, the work of the I.L.O. This has since been corrected by the coming of Industrial Committees, to which I propose to make reference later.

The importance of International Labour Conferences as a world forum of discussion of social and industrial progress has been emphasised by the attendance of an increasing number of Ministers of Labour as the years have gone by. They not only speak but they also meet many representatives of employers and workers from other countries, with whom they have useful talks of mutual advantage. I make bold to say that, if the I.L.O. had accomplished nothing else, it would still have been worth while as the means by which large numbers of men from different countries of the world could meet and know each other.

There enters into my mind as I refer to this aspect of the I.L.O. the dinner given every year by British employers, through the generosity of Sir James Lithgow, at which every man or woman coming from the British Commonwealth is present. Nobody can be present on these occasions without realising its binding power.

Since I retired I have been to many countries and in all of them I have met friends as a result of my I.L.O. work, men whom I would never have known otherwise. I am quite sure that in the contribution of the I.L.O. to the solution of the world's industrial problems we should place high the ever widening human contacts which that Organisation has brought about.

This is operating silently but very effectively. I remember that when I first went to Teheran I met a Persian whom I had first met at Geneva and whom we persuaded to follow his interest in improving the conditions in his country by coming to Great Britain to see something of Ministry of Labour work. I found him to be Director of a newly established Ministry of Labour and he proudly showed me an Employment Exchange modelled on those he had seen here and even the card filing cabinets were made on the same scale as our own. In all the backwardness which has to be overcome we must remember always that, inspired by the experience of the I.L.O., there is a growing number of those who are quietly working towards better things.

It is, in my opinion, unfortunate that the work of the I.L.O. is not yet regarded as having an important place in diplomacy. Those who deal with labour matters are still regarded as on the fringe of international relationships, as a kind of specialist of whose activities diplomats cannot be expected to become informed. The notion that international relationships are matters for a selected few dies very hard. It is significant, however, that dictators have founded their power on a labour policy. We have seen over the years in proceedings at I.L.O. meetings the coming of future events. I remember the coming of Dr. Ley to Geneva, the immediate solidarity of Germany, Italy and Japan, whatever the subject. Nobody experiencing that particular Conference and all that took place there could have had any doubts as to the real position.

I have dwelt on this human side of the I.L.O. activities because I believe that in looking to the future, its importance should receive greater recognition. The I.L.O. is an organisation which occupies a significant place to those countries which are its members. Because they are members they are prepared to receive advice and assistance from it and through it which, as a matter of national pride, they would not accept from another country. One of the most striking facts of history was the ease with which it was possible to hold a tripartite Conference of Allied and neutral countries in New York in 1941, in the most difficult and dark days of the war. This is to be contrasted with the political upheaval when a similar attempt to hold an international conference was made in the first war. All who took part in that Conference know the gladness with which those who had been accustomed to meet in the days of peace met to reaffirm their beliefs when the future was so dark.

The central part of the activity of the I.L.O., especially in the first half of its history, was the discussion and adoption of Conventions and Recommendations.

From 1919 to 1939, 67 Conventions and 66 Recommendations were adopted and from the resumption of regular International Labour Conferences at Philadelphia in 1944 33 further Conventions and 26 Recommendations have been adopted. These are frequently referred to as the International Labour Code. In no other field of economic or social policy does so comprehensive a body of international obligations and standards exist. The scope of the Code is wide. The subjects dealt with include : employment and unemployment (employment services, national development schemes, provision for unemployment, the organisation of employment during the transition from war to peace); general conditions of

employment (wages, hours of work, weekly rest periods, and annual holidays with pay) ; the employment of children, and young persons (age of admission to employment, medical examination for fitness for employment, vocational training and apprenticeship, night work) ; the employment of women (maternity protection, night work, employment upon unhealthy work) ; industrial health, safety and welfare ; social security ; industrial relations ; labour inspection ; maritime labour ; social policy in non-metropolitan territories ; migration and statistics.

Supplementing the work of the International Labour Conferences there are many Standing Committees, usually constituted of experts, which maintain constant activity in the subjects with which they deal. Among these are the Permanent Agricultural Committee, Committees on Social Insurance, Industrial Hygiene, the Permanent Migration Committee, Committee on Social Policy in non-Metropolitan Territories and the Committee of Statistical Experts.

In the pre-war years, besides visits to countries by the Directors, officials on request visited countries in order to advise them on particular subjects but Geneva remained the main centre of the Organisation's operations until after the war. In the amended Constitution, however, based on the Declaration of Philadelphia and adopted at Montreal in 1946, there is a provision explicitly authorising the International Labour Office to accord to Governments at their request all appropriate assistance within its power in the framing of laws and regulations on the basis of the decisions of the Conference and the improvement of administrative practices and systems of inspection and, besides strengthening the technical resources of the Office for this purpose, a panel of outside experts has been constituted to be available for technical advice and assistance to Governments.

Great as were the effects of the work of Conferences and Committees in the countries of the world, the Organisation's decisions and activities were largely dominated by Western trade union and political considerations. While representatives of less advanced countries continued to send representatives and to take an active part in the work the feeling grew that, so far as they were concerned, the proceedings lacked reality. The first movement towards the decentralisation of the Organisation's work to bring it into closer touch with the special conditions and problems of these countries was the Regional Conference of American countries, held in Santiago in 1936. This enabled the nationals of those countries to bring forward and discuss their own conditions and the result was to strengthen the interest and influence of the South American countries in the work of the Organisation. It is of interest to note that one of the most prominent subjects was the need of immigrants from other countries for the development of the vast natural resources of South America. This caused the Organisation to renew the efforts it had made on the subject of migration, to meet the demands of such countries as Poland and Italy for an outlet for their surplus people. These efforts were abortive as no country was willing to assist to provide the money necessary to initiate such a movement. It is possible that, if the efforts of the Organisation had met with a more helpful response, the better situation in Central Europe might have reduced the causes for war. It is to be hoped that the present efforts on the subject of migration will be more successful.

Events during and since the war have forced a different outlook as regards Eastern and Middle Eastern countries, the representatives of which had constantly urged the need for greater sympathy and regard for their special circumstances. As a result, the policy of Regional Conferences initiated at Santiago has been widely developed. It had become clear that Western representatives whose whole experience had been in advanced countries and who were completely ignorant of the mentality, traditions and circumstances of Eastern peoples had been over-confident in their assumed right to determine the regulations which should apply in those countries : we are all prone to forget our own past circumstances, for example in 1851, when our own modern trade union movement was in its early struggles, poverty was rife, the masses had not attained the franchise and few were educated. We forget also the long and hard years of struggle for economic, social and educational developments. I am afraid also that the most advanced countries do not always appear as countries able to settle their own labour problems.

Yet there appear to be many who are active in the international labour field who believe that Western institutions (ignoring the great differences between them even in, say, Great Britain, the U.S.A., and France) can be planted in the Middle East or Far East, without any similar preparatory and educational period. This ignorant action can do great harm and in the end defeats its own objects. Listening to discussions on the organisation of free trade unions it has been evident that Western and Eastern representatives, the latter with poverty, ignorance and corruption in mind, completely fail to understand each other. Outside the I.L.O. stands Russia with a system suited to a tradition of autocracy and serfdom, a system which is contrary to all that the I.L.O. stands for. It is obviously vital that the I.L.O. approach shall be sympathetic and not over-confident and that there should be a humble desire to learn before there is an effort to teach. It is now fully recognised that industrial development in Asian countries is likely to be markedly different from the development in countries which felt the impact of the industrial revolution earlier, if only because of the immense technological progress and changes in general social outlook in the last thirty years. There are different factors such as climatic conditions, tenacious social conditions reaching back to ancient times, lack of capital resources and technical skill and rapidly growing population. The need for special action in Asian countries has been fully realised by the Governing Body of the I.L.O. and the Director-General, and a wide extension of I.L.O. activity was initiated by a Preparatory Asian Regional Conference at New Delhi in the autumn of 1947, followed by a Regional meeting for the Near and Middle East at Istanbul. At each of these resolutions were passed indicating the basic need of economic development, including the development of industry and the improvement of conditions in agriculture, upon which depended the attainment of the social standards of the I.L.O. The close relationship between the I.L.O. and the United Nations enables these matters to be the subject of helpful joint consultation with greater prospects of co-ordinated and constructive action than in former times. In preparation for the First Asian Regional Conference a mission from the I.L.O. visited a number of Asian countries in order to obtain first hand information and to discuss this with employers' and workers' represent-

atives for the purpose of preparing reports for consideration at the Conference. The Director-General also visited Ceylon and India in order to study at first hand the special problems confronting these Member States. The Conference was held in Ceylon in January, 1950, and 18 countries were represented with observers from Japan and the United States and representatives of the United Nations and the specialised international agencies. In March, 1950, the Governing Body decided to establish an Asian Advisory Committee on a tripartite basis to advise them on Asian problems and on the Asian aspects of general problems. In addition much technical assistance has been given on such matters as employment service organisation, industrial relations, technical training and training of instructors, reorganisation of handicrafts. Such technical assistance activities have been undertaken under the ordinary programme of the I.L.O., under the expanded programme of the United Nations and the specialised agencies for technical assistance to undeveloped countries. Missions have been sent to various countries at their request and I would refer specially to that which recently visited Iran, to the value of which I can personally testify. As I have said, assistance and advice from the Organisation of which a particular country is a member is more acceptable from the point of view of nationalist feeling than similar action by representatives of another country.

While I have referred only to the Middle East and East (and I have not given a full account of all such activities in those regions), there have been similar activities in America and elsewhere, and it will be seen that the I.L.O. can no longer be regarded as an organisation which discusses world policies remote from those concerned and their circumstances. Its work is now carried on in the midst of, and with the assistance of those whom it affects and thus they are given the benefit of experience elsewhere in the most effective and informed manner. Moreover this more intelligent approach has reduced the likelihood of a separation of the East from the West, a separation which would have most undesirable consequences. There is still, however, too little recognition of the growth of nationalist feelings and we are experiencing today some most serious results of this failure.

Another important development in I.L.O. machinery has been the establishment of Industrial Committees for individual industries, on the proposal of Great Britain under the direction of the late Mr. Ernest Bevin as Minister of Labour and National Service. The representation of employers and trade unions at International Labour Conferences had not greatly changed as regards personalities over many years. They came mainly from the most prominent officials and there were few appointed from among the general ranks of those who were closest to the rank and file of the workers. The interest of the latter, therefore, in the Organisation's work was remote. When the question of the application of the 40 hour week was referred to Conferences of individual industries it was seen that a large number of employers' and workers' representatives were given their first direct acquaintance with the I.L.O. and that the result was a greatly widened interest and knowledge in those industries. There had already been Coal Mining Committees in which it was seen that the representatives sank their differing nationalities in their common interests as men engaged in the same industry and subject to the same vicissitudes and hazards. Based on

this it was proposed that there should be regular meetings of employer and worker representatives on Joint Committees for individual industries. It was considered that such Committees would (a) broaden the basis of the I.L.O.; (b) provide a new and valuable addition to the means for strengthening international friendship and co-operation and (c) bring employers and workers together in the discussion of circumstances on which they were well-informed and give them more exact knowledge of the circumstances in other countries. It was intended that, following the excellent example of the Joint Maritime Commission, these Committees should be bi-partite with an independent Chairman as the only outside element. The I.L.O., however, is conservative in such matters and the Committees have a tripartite constitution. The result has been to make them more formal than they were intended to be and to cause the employers' and workers' sides in face of Government representatives to act always as opponents. Nevertheless they are a valuable addition to the machinery of the I.L.O. and are in the direction of that devolution which is necessary if there is to be the widest possible interest and participation in its work. It is interesting to note that the Joint Petroleum Committee brought employers' and workers' representatives of this world-wide industry together for the first time.

The emphasis on different fields of the Organisation's work inevitably shifts from one to another according to the prevailing thought of the time and the circumstances which arise in the countries of the world. As I have indicated a complete Code of Conventions has been adopted covering the protection of the conditions of industrial and agricultural workers. Since the war considerable attention has been given to the question of Freedom of Association and Protection of the Right to Organise, in view of its new importance, and a Convention on this subject was adopted in 1948.

In this connection and as a result of a recommendation made by the United Nations and following consultations between this Organisation and the I.L.O. a Fact-Finding Commission on Freedom of Association has been set up. This is constituted of nine distinguished persons from different countries. Under the arrangements approved both by the Economic and Social Council and by the Governing Body it is open to the United Nations, acting through the Economic and Social Council, to refer allegations of infringements of trade union rights to the Fact-Finding and Conciliation Commission. All allegations against I.L.O. States Members regarding such infringement received by the Economic and Social Council will be forwarded to the Governing Body of the I.L.O. for its consideration as to reference to the Commission, with the consent of the Government concerned. In regard to allegations received by the Council against Members of the United Nations which are not members of the I.L.O., the Secretary-General, on behalf of the Economic and Social Council, will seek the consent of the Government concerned to the reference of the allegations to the Commission. This arrangement, which is an interesting example of co-operation between the United Nations and the I.L.O., is based on the guiding principle that there should be impartial examination of the facts in an atmosphere free from political prejudice of any kind or of propaganda in any interest whatsoever.

Many other important subjects have been under discussion, with a view to widening and bringing up to date the International Code. While, however, in the past the bias of the work of the organisation has been towards research and the formulation of international instruments, in recent years when Governments, with the great changes in social policy, have embarked on legislation often based on the international standards, they have had to build up the administrative and other machinery for the fulfilment of their programmes. To this end many of them have sought the benefit of practical experience available through the I.L.O. in such fields as employment service organisation, vocational training, etc.

During the last few years, the I.L.O. has been placing an increasing emphasis on the development of a programme of practical assistance to its members, more particularly in the manpower field. Its "Manpower Programme" was originally instituted on a European basis, but has since been vigorously extended to Asia and Latin America. The Organisation has been enabled to intensify these activities as part of its contribution to the expanded technical assistance programme of the United Nations and the specialised agencies. To assist in the implementation of its programme, the I.L.O. has set up special field offices in Rome, Bangalore and San Paulo (Brazil). Special missions to assist in connection with migration problems have also been established in Western Germany and Austria.

Broadly, the I.L.O.'s activities in the Manpower field cover employment service organisation, technical training, and migration. The I.L.O. promotes the development of employment exchange services and arrangements for technical training by convening special technical meetings, by the despatch of technical missions, by the loan of experts, the granting of fellowships, and the practical advice and assistance which it renders, not only from Geneva, but also on the spot through the field offices. In regard to migration, the I.L.O. has so far concentrated on the problem of surplus population in Europe. Last year, it convened a Preliminary Migration Conference, which was attended by representatives of interested Governments, and of the other international organisations concerned. The Conference agreed upon a number of proposals as a basis for future action. In the light of these decisions, the I.L.O. has since been in further consultation with Governments and is to present further comprehensive proposals at a further Conference which is to be held at Naples in October this year. Meanwhile, the I.L.O. has been carrying out a great deal of useful practical work in the migration field; for instance, by establishing labour surpluses and deficits, by facilitating the necessary contacts between the Governments concerned, and by assisting them to overcome any practical and administrative difficulties hindering the movement of labour from Europe overseas. The Organisation has been assisted by special funds made available through the Organisation for European Economic Co-operation (O.E.E.C.).

At every stage the I.L.O. has sought the co-operation of other organisations actively working in related fields, in particular of the United Nations and its regional commissions, the Food and Agricultural Organisation, the World Health Organisation, the International Bank, etc. These efforts ensure the development of a co-ordinated international manpower pro-

gramme in which many international organisations will play an effective part. The agreements between the United Nations and the specialised agencies such as the I.L.O. have produced a much more promising situation than that in the inter-war years when the I.L.O. failed to secure such assistance in its work on Unemployment and Migration. Care is being taken, however, to avoid overlapping of functions and the waste of the limited resources available.

Numerous statements at recent sessions of the International Labour Conference have made it clear that these "operational" activities are meeting a very real need, particularly in the industrially under-developed countries. There is no doubt that this side of the Organisation's work is likely to assume increasing importance. At the same time, it is not regarded as in any way supplanting the I.L.O.'s historic functions in the field of international labour legislation. The two functions are, in fact, complementary. This fact is illustrated by the Conventions and Recommendations adopted by the Conference during recent years. These include the Employment Service Convention and Recommendation (1948); the Migration for Employment Convention and Recommendation (1949); the Vocational Guidance Recommendation (1949); and the Vocational Training Recommendation (1950). Such instruments are designed to establish the standards which the Organisation, through its operational work, assists governments to achieve.

While wages questions, industrial relations, full employment, social security and welfare are major issues of labour policy, the basic matter upon which all depends is the increase of productivity, especially in under-developed countries and in countries having unfavourable balances of payments. The widespread unemployment in the '30's is still a vivid memory. Indeed much of the resistance on the part of workers to changes in practice is due to this memory and to lack of confidence in future security of employment. The Office has in hand a comprehensive technique for various measures concerning the stabilisation of employment, the relation of wages policy to full employment, particularly to the problems involved in regard to increases of wage payments based on greater productivity and avoiding a disturbance of relative price stability. There is also the human problem of how to facilitate economic and social relationships among employers, workers and other groups in the economy so as to achieve continuing full employment and at the same time achieve flexibility and efficiency in production and avoid inflation.

There is no simple solution to these social problems of the present time but it will be seen that the I.L.O. is facing up to them and endeavouring to provide the material for their informed examination. It is necessary that in each country the employers' and workers' representatives who take part in the Organisation's deliberations shall have the help of all concerned in their important task and it is to be hoped that one result of this Exhibition¹ will be to create a new interest in the work of those who are attempting to bring reason and thought to bear on problems which can only be solved by the co-operation and goodwill of all concerned.

¹"Manpower—the human factor in industry" Exhibition, Safety, Health and Welfare Museum, Horseferry Road, S.W.1. Open week days 10 a.m. to 6 p.m., admission free.

In the time available to me I have not been able to speak of more than the first Director of the Organisation. I should not like to end without referring to the devoted work of Harold Butler and John Winant and Edward Phelan, to all of whom the Organisation owes so much. Each of these made a different contribution and every such contribution was necessary. Mr. David Morse, the present Director-General, whose restoration to good health is so satisfying, has shown the imagination and breadth of vision which the present times demand and is a worthy successor to his distinguished predecessors.

The Governing Body, which is the General Purposes Committee of the Organisation and directs its activities, has recently again been increased in size to meet modern circumstances. There are now eight Government representatives acting collectively as deputies to the eight selected Government members, in addition to eight worker and eight employer deputy-members. This enables those attending the meetings of this important body to be drawn more widely from the Member States. This increases the interest in its proceedings and is in accord with the general policy of broadening the field of active operations. Meetings of the Governing Body are also attended, as a matter of right, by representatives of international employers and trade unions federations, the United Nations and United Nations Specialised Organisations. Members of the Governing Body similarly attend meetings under United Nations auspices. The agreements made in regard to such representation are aimed at securing the maximum of co-operative action and avoiding overlapping. There must always be faced the possibility of some organisations attempting to become dominant but it is certain that employers and workers will resist any attempt to weaken the position assured to them in the International Labour Organisation by the encroachment on its proper sphere of work of any other body on which they are not represented.

But it is necessary that the International Labour Organisation shall not be merely another platform for individuals who think that they know all about what other people require and see the solution of the problems of humanity in the adoption of their own plans. The object of including employers' and workers' representatives in the International Labour Organisation Constitution was to associate the men and women of each country with its work, to see that it was always informed of their circumstances and their desires, to stimulate among them real thought on the basis of the actual facts and so produce a sense of co-operation and self-help within and among peoples. In our country we are confronted with this very problem at the present time and there is obviously a wide gap between responsible leaders and those whom they represent. The main problems of the world are still ignorance and poverty among untold millions of people. Progress cannot be fast and it can only be made real by that close touch with the common people that the I.L.O. Constitution was intended to secure.

In his Report to the last International Labour Conference, the Director-General wrote some wise words with which I may conclude because they express all that I am trying to say.

" . . . We have learned that enterprise and initiative are indispensable if anything positive is to be achieved. The difficulties are so great that the vicious circle of poverty, ignorance and disease can be broken only if those who have enterprise and initiative are willing and able to use them. Governments, private individuals and international organisations can contribute in different ways. Together they can take the essential steps of progress.

They must proceed with a full knowledge and understanding of all the facts. They will not achieve progress, and may even cause a backward movement in society, if they attempt more than can be successfully managed at once, or if, by introducing methods alien to the qualities and character of the people, they break down the structure of society and have nothing wherewith to replace it. They must relate their plans to the resources available and to the practical difficulties before them, and work only in ways which can win the understanding and support of the people themselves. If we open our minds to the experience of the past we can learn much from its lessons and avoid many mistakes which have proved costly in human suffering.

We need to do everything we can to link together the peoples of the world in this effort. We need to use every means to help others to help themselves : loans and grants, expert assistance, a wide fund of experience. This contribution can be immense. But it can only spark and assist, it cannot replace, action by the people themselves. . . ."

Self-Government in Industry

by SIR GEORGE SCHUSTER, K.C.S.I., K.C.M.G., C.B.E., M.C.

Wednesday, 26th September, 1951

I HAVE been asked to speak on "Self-Government in Industry", and I imagine that I am expected to concentrate attention on one particular method for attaining self-government, the method of so-called Joint Consultation. So much has been written recently on this subject that it is difficult to say anything new; but I think there is a need to take stock of current ideas and see where they are leading. In particular there is a need for clear thinking on what we are really aiming at, and for a clear perception of how particular measures fit into the framework of our total national problems and aspirations.

That means getting down to the elements of the situation, and so I am going to be very elementary and ask three questions—"What"—"Why"—and "How":

What do we mean by Self-Government in Industry ?

Why should we seek to achieve it ?

How—by what practical methods—can we work towards achieving it ?

The first question is very necessary, because the term itself—"Self-Government in Industry"—is vague and ambiguous. It can be interpreted in many ways—some of them, I believe, dangerously wrong.

THE FIRST QUESTION

WHAT DO WE MEAN BY SELF-GOVERNMENT IN INDUSTRY ?

What I mean by it is this. The ideal objective should be to make each industrial unit a harmonious live co-operating community, spontaneously working together for a common purpose which is understood and accepted by all its members.

I hope as I proceed to bring out more clearly the practical significance of this definition. But, at the outset, I want to clarify what I mean by stating what I do not mean. One thing which I certainly do not mean is the idea implied in the common phrase "worker control"—the idea which finds expression in some forms of so-called syndicalist doctrine, the idea conveyed by such remarks as "We shan't be satisfied until the workers run the management instead of the management running the workers".

In saying this I have plunged straight into the core of the problem with which I am concerned. It is impossible to conduct any modern industrial enterprise successfully without the exercise of authority, without the guidance of leadership, without the practice of discipline. The rank and file cannot by themselves supply the creative leadership which is required.

The fundamental problem is how to combine authority and participation—leadership and co-operation. For any successful combination there are three vital conditions : first, that the leaders' authority should be vested in men who are, and are recognised to be, worthy of it ; secondly, that this

authority should be *accepted* authority ; and, thirdly, that leadership should not be over-centralised or dictatorial, but spread as widely as possible and exercised in a way which allows the maximum opportunity for initiative and self-expression for all the individuals engaged at all levels in each industrial undertaking.

It is with considering means for the fulfilment of these conditions that I shall be chiefly concerned in my later remarks ; but before I pass to these I want to pause to emphasise the importance of the issue. I do this because I believe there is a real danger today in this country of a wrong kind of reaction against the idea of leadership. Some reaction is of course natural because of our strong detestation of the "leader" idea as exemplified in Hitler or Mussolini or Stalin. What I mean by leadership is poles apart from that.

This issue of course has a significance not only within the sphere of industrial organisation, but for the whole social order. In saying this I have in mind Arnold Toynbee's famous analysis of the breakdown of civilisations. As I see it, the essence of the lesson which he draws from his survey of human history is that no nation can develop fully unless there is a dominant minority which has a creative message and which can persuade the majority to follow it. *The majority cannot create.* I believe there is a core of fundamental truth in this, which it is above all necessary for us to appreciate today.

But I must turn back from these wide reflections to get closer to my own subject, and to consider the idea of "worker-control" in industry from which I started. As to how far this kind of idea is in people's minds today, I may refer to a recent nation-wide survey of joint consultative methods in British industry which was conducted by the National Institute of Industrial Psychology as one of the projects sponsored by the Panel of Human Factors of which I was Chairman. Among the extensive range of firms investigated in this survey no evidence was found of any organisation having as its object syndicalist aims of this kind. One can also note that pronouncements of responsible members of the Trade Union movement have all been opposed to the aim of syndicalism through joint consultation. It may well be, therefore, that the prevalence of this idea does not represent a serious danger. But it is a danger which cannot be entirely ignored and its presence may lead to another kind of danger—namely that there may be resistance to the right ideas of participation and joint consultation just because they may be suspected of tending in this direction.

As a statement of what might be described as the orthodox Trade Union view I can quote the following passage from a speech by Mr. Gunter, the Member for Doncaster, in a recent Parliamentary debate (April 5th, 1950) on joint consultation (Hansard, Vol. 473, p. 1251).

"Another point we ought to get perfectly clear in our minds is that there is still a lot of confused talk about the meaning of joint consultation. There has been an amazing revival of the old syndicalist idea of direct workers' control in certain sections of labour. In my opinion, it is impossible to envisage any great development in the sphere of joint consultation if we imagine that this old, woolly idea of workers' control can operate. In the last resort management must be allowed to manage and to make decisions, and must accept the responsibility. What we seek is that their

decisions and policy shall be translated to the workers so that they may understand their objectives and thereby help to ensure that co-operation which can result in much better and higher production".

I welcome this as a sensible well-balanced statement which I can use as a starting point for my own remarks. It points to certain questions. On the negative side—as a disclaimer of wrong ideas—I accept it as fully satisfactory; but on the positive side, in its conception of what worker-participation should mean, does it go far enough? Is it enough to claim that, as a means for ensuring co-operation, "the decisions and policy of management shall be *translated to the workers* so that their objectives may be understood"?

My own view is that this does not go far enough, and that more is necessary in order to achieve the essential objective as I have stated it—namely to create within each industrial unit a harmonious co-operating community working together for a common purpose.

I can perhaps throw light from another angle on the meaning of this idea. As a sequel to a recent visit to the United States I have been in close contact with the executives of one of the largest American corporations which is conducting some most interesting studies in the working of different forms of organisation. The President of this corporation in circulating to all his executives a paper prepared by his Personnel Director used the following words :

"Mr. X has put his finger on what I regard as the greatest weakness of large industrial organisations in this country. We complain about government in business, we stress the advantages of the free enterprise system, we complain about the totalitarian state, but in our industrial organisations, in our striving for efficiency we have created more or less of a totalitarian organisation in industry, particularly in large industry. The problem of retaining our efficiency and discipline in these large organisations and yet allowing our people to express themselves, to exercise initiative and to have some voice in the affairs of the organisation is the greatest problem for large industrial organisations to solve".

I would add the following quotation from the paper itself.

"The essence of free enterprise is a system of economic and political organisation which taps spontaneously the creative and productive resources of its citizens".

The essence of my own idea of "Self-Government in Industry" is exactly that of a system which taps spontaneously the creative resources of all who are working in it.

THE SECOND QUESTION—"WHY"?

Having dealt thus briefly with my first question "What is the objective?" I turn to the second—"Why should we seek it?" To this question my answer would be partly for its own sake because it is intrinsically right—it is in harmony with the tradition of liberal democracy which is the common heritage of all our political parties in this country)—and partly for the sake of its results. And as to results, there are two purposes, efficient production and the interests of the worker—to achieve the greatest possible

efficiency in production, and to create conditions in which the individual worker can find opportunity for self-expression and self-development in his work and so put his heart into it and get satisfaction from it. Those two purposes fit in together—neither can be fully achieved without the other.

I wish I had time to deal more fully with them because it is so essential to appreciate the significance of what is involved and to realise how the two purposes are inter-dependent. But I must content myself now with a few remarks on the connection between the objective as I have defined it and the practical production problems with which we are likely to be faced in the next years. It is of course obvious that our national survival depends on attaining a vastly improved standard of productive efficiency, and that this is not possible without a great co-operative effort. But the special aspect of our difficulties which is relevant to my present purpose arises from our economic dependence on other countries. We face unknown rapidly changing conditions in which industrial production may be affected at one moment by raw material shortages, at another by loss of foreign markets through new competition or artificial barriers, and so on. We shall have to cope with a constantly recurring need to change direction and to reshape our efforts so as to fight new problems on new fronts. In such circumstances the crucial need will be for adaptive flexibility and adventurous enterprise. The course of events which I envisage, with its ever-changing problems, will make great demands on the workers in various industries. It will be more necessary than ever before that they should understand what is happening and what may be required, so that our whole industrial army may work in willing co-operation.

I do not see how we can face those problems successfully unless we can as a whole nation pull together, and that means not only full co-operation as between industry and the Government but also the right kind of co-operation within industry in each industrial unit between management and workers—the kind of co-operation which I have envisaged in my definition of self-government in industry.

THE THIRD QUESTION—"HOW". PRACTICAL METHODS

I pass next to my third and most difficult question—the question *How*. What practical methods will work effectively to the fulfilment of this objective?

Here I ought to begin by a warning against the danger of loose generalisations about British industry. There are such vast differences in circumstances between different districts, between different industries and between different concerns within the same industry that the precise nature of the problem or of the methods which will be effective may differ widely in different cases. One must keep these differences in mind; but at the same time there are certain general principles which have universal application and there are certain broad considerations which must always be taken into account.

So I come back to my central question—how to create within each industrial unit a satisfactory co-operating community.

The first thing to say is that it is no use to pursue this particular objective in isolation. It must be seen as part of the total situation, and that is a *human situation which cannot be understood in terms of mechanical conceptions*. It is no use, for example, for a firm to say "We like this idea of co-operation. Therefore let's introduce joint consultation"—just as one might say "Let's put in a system of central heating into a house". The idea of co-operation or joint consultation won't work *unless the total situation is right*. If this is accepted, then it is clear that to deal adequately with my question it is necessary to take account of the whole field of management and all that affects human relations. Obviously there is no time for me to do that this afternoon, and yet, if I am to accomplish my purpose of showing how my particular subject fits into the total problem, I must briefly run over the important heads.

I have to start by saying that there are two over-riding conditions to be satisfied by management without which no practical arrangements can be fully effective. These are :

Functional Efficiency

and

The Right Spirit

As to *functional efficiency*, the first duty of anyone who holds a managerial position is to do all in his power to make himself efficient. He ought not to hold on to a responsible job if he is not. This must be seen not only as an *ethical obligation*, but also as a matter of great practical significance for the objective which I am considering. As Sir Stafford Cripps has well said "Co-operation depends on confidence. And confidence depends on competence".

I turn next to the second condition, the *right spirit*. Good human relations in industry must be based on genuine interest in the workers for their own sake. If managers start now to take a human interest in the workers *merely* in order to improve production results they will not succeed.

PRACTICAL ARRANGEMENTS

Having stated the two over-riding needs of functional efficiency and the right spirit, I next have to ask through what practical methods this efficiency and spirit have to be expressed. In thinking out what is involved I have found it helpful to consider practical arrangements under six main heads.

1. Working conditions and industrial health.
2. Arrangements for the division of the proceeds of the work.
3. Arrangements for "fitting the job to the man".
4. Arrangements for "fitting the man to the job".
5. Form of organisation.
6. Methods of communication and joint consultation.

A mere glance at this list shows that it would be impossible for me to deal adequately with all these headings this afternoon. Yet they all have a direct bearing on my subject, and unless they are rightly handled there can be no full realisation of the kind of co-operating work-community which I contemplate.

INDUSTRIAL HEALTH

Obviously people cannot put their heart into their work or get satisfaction from it without an adequate measure of health—physical and mental. There is need today not merely to devise more effective preventive measures against industrial diseases and accidents, but also to plan all the work with the constructive idea of creating positive conditions of health.

PAY

Then again take the question of the division of the proceeds of work—how can there be full harmonious co-operation unless standards of pay are, and are accepted as, both adequate and fair—fair in relation to skill and effort, fair in relation to what others are getting, fair in relation to what the employing concern can afford?

Some of you may think these ideas so obvious as to deserve no special mention; but they involve many difficult problems and there is need for much more study in order that they may be rightly handled.

FITTING THE JOB TO THE MAN

My other headings bring me closer to my central subject. "Fitting the job to the man" involves problems of designing machinery with regard to the human begins that have to operate it, and planning production processes and the subdivision of jobs in a way which takes account of the effects on people's minds and bodies. Here there are many questions to ask. May it not be true that—even from the production point of view—modern practices are going too far in simplifying work processes, and breaking down jobs into elemental components so that the workers themselves come to be regarded in Peter Drucker's phrase as "rather imperfect machine tools"? Can one expect intelligent team work on production from human beings whose function in the production process gives them no chance to exercise their intelligence or become well-rounded persons?

FITTING THE MAN TO THE JOB

Next, when I turn to "fitting the man to the job" I am brought up against questions which are still more clearly relevant. Here one has to consider methods of selection and training both for the step of initial placing and for the step of subsequent promotion. Both steps are important; but in my present context it is methods of training and selection for promotion that matter most. In my opening remarks I referred to the fundamental problem as one of *combining participation with authority*, and among the essential conditions for any successful combination I mentioned first that the leaders' authority should be vested in men who are worthy of it, and secondly that the authority should be *accepted* authority. Can there be any chance of fulfilling these conditions unless everyone is satisfied that the methods for selection for promotion are such as to pick out the best men without any influence of nepotism or favouritism. Can there be any chance of producing the co-operating community of my objective unless all managerial posts from foreman upwards are held by people who are worthy of the posts and have been chosen in a way which commands confidence?

FORM OF ORGANISATION

Up to this point I have merely hinted at the significance of the headings on which I have touched. When I turn to the heading "Form of Organisation" I come to questions on which I must be more specific. No methods of joint consultation can possibly be effective unless they are founded on an organisational framework which is satisfactory. As to this, without any attempt to be exhaustive, I should like to concentrate attention on four main needs.

- (i) *Clear line of authority*—so that everyone knows for what and to whom responsible.
- (ii) *Adequate decentralisation*—the essence of good organisation being that *every decision can be taken at the lowest level at which it can be effectively taken*, so that nothing is held up unnecessarily for reference to higher level.
- (iii) *Maintenance of personal relationship*—avoidance of remote impersonal control. Every individual should feel that he has someone in the line of authority above him who is in personal contact with him, who can appreciate his work, who can listen to his suggestions about it, and who is so placed that he can ensure that proper attention is given by "management" to these matters.
- (iv) *Work should be so organised as to allow formation of effective working groups*. The most important problem in modern industrial organisation is to discover in each case what is the most effective working group—large enough to accomplish a recognisably distinct component part of total operations, small enough to give individual members the sense of personal comradeship and feeling that each has within his own group a significant part to play. The primary groups must be combined in the whole.

I can now turn to my final heading ;

COMMUNICATION AND JOINT CONSULTATION

I have included the word Communication because I consider the art of communication is a matter of vital importance and one to which far too little thought has been given. I cannot deal with it fully now. I will merely emphasise that good human relations in industry can only begin after good communication has been established.

So I pass to *methods of Joint Consultation*.

When I turn to a closer consideration of these methods there are many things of a general nature to be said which are commonly accepted in the current literature on the subject. I will only select a few points.

First, it follows from all that I have said up till now that the value of joint consultation is dependent on the general morale situation. If there is a bad morale situation joint consultative committees cannot work effectively. They may perhaps bring to light some points of grievance, but even that is not certain. It is quite possible that they will simply create distrust of the system and damage future efforts. For that reason I am against suddenly imposing uniform universal procedures or compulsory joint consultative committees.

The second important thing to say is that the spirit matters more than the form, and formal joint consultative procedure with committees must be supplemented by informal discussion on the job at all levels and all the time.

Next, I want to call attention to a very valuable statement of general conclusions at the end of the book recently published by Sir Charles Renold, our chairman of today—"Joint Consultation over Thirty Years". I find myself in complete agreement with what he says, and I should like to mention some of his points.

As a first condition of success he takes the attitude of higher management. Unless management is imbued with respect for its people as human beings and with a genuine desire to carry them with it, institutions and procedure will prove sterile. This is in close accord with what I have already said about the right spirit.

Next he says that the first organisational requirement concerns that of management itself. It is not merely a question of consultation between top level management and workers' representatives, but between every level of worker and the levels with which each worker is in contact. Again I entirely agree.

Next he stresses the importance of getting the formal procedures clearly understood and defined. Meetings should not be *ad hoc*, but on a regular programme and conducted on an agenda agreed beforehand.

And then he comes to a point of which I want specially to stress the importance. The field open for discussion must include things that really matter—not merely ventilation of minor grievances about amenities. And he goes on to say : "One sure way to secure this is to recognise one and the same body of workers' representatives for both negotiation and for consultation. The prestige and sense of responsibility of workers' representatives on consultative committees can be greatly enhanced if they can be treated as the accredited agents of the Trade Unions and if negotiations are conducted through them in the first instance on matters usually handled direct with external Trade Union officials". I am convinced that this is a matter of vital significance. The chief reason why in many cases joint consultative methods have not till now proved fully effective is that they are regarded as something outside the stream of things which really matter, little more than a thin façade which is no part of the real structure. How to make them part of the real structure and how to get this line of procedure accepted by the Trade Unions is one of the most important problems in this whole field.

But, while I have quoted the conclusions of Sir Charles Renold as true and valuable, I feel sure he would be the first to agree with me that he has not in his own Company yet reached any final solution ; but that, as each step forward is taken, new problems open in front of him and that he is still far away from what he would regard as a full realisation of his objective.

And this brings me to one of the main points that I want to make. If industrial managers are honest in their purpose of making joint consultation a reality as a move towards what one can call industrial democracy, *then they must realise that they are taking first steps in what is really a revolutionary change*. If it is to mean anything important, they will be embarking on a

very far-reaching course, and they must have both a clear idea of their ultimate aim and also the courage to go through with their efforts in spite of difficulties and disappointments. It is just for this reason that I feel it to be so necessary to be clear on the kind of elementary questions with which I started, particularly the question—what is the real aim ? I have stated this as being to create a working community with a common purpose and that for two main reasons, first for the sake of the individual worker and, secondly, for the sake of production results.

As to the individual worker, he should be able to understand the purpose and the policy of the firm and the place of his own job in it ; to feel that he counts as a person, that he has a point of view and a part to play, the importance of which is recognised ; to feel that good work is appreciated ; to feel that he has some freedom for self-expression in his work in the sense that *he has a say as to how his daily job is handled* ; to have a foundation for confidence in his leaders, by getting an understanding as to why things are done in a certain way ; and, finally to have a chance to understand the financial position and to satisfy himself that the proceeds of work are fairly divided. All this seems to me to be necessary as a foundation for satisfaction in work and true co-operation.

Then, looking at the matter from the point of view of getting the best production results, I see two main advantages in joint consultation properly interpreted : first as an aid to the right kind of decentralisation, and secondly as a way for ensuring that authority is *accepted* authority. Joint consultation is rightly to be seen as a method of bringing about a sharing of responsibilities. But this ought not to mean getting responsibilities confused or divided. As I have already emphasised, the chief executive officer in an industrial undertaking, just like a military commander, has certain responsibilities for leadership and decision which he cannot devolve. There should be no weakening in his leadership and authority. But that does not mean that he should not help all ranks to understand the reasons for his decisions *nor* (when it comes to settling how operations are to be carried out), does it mean that he should not try to get ideas by consultation with them. Further, it does not mean that the top executive or commander must take *every* decision. In the conduct of any industrial enterprise, just as in a military operation, there are different levels at which decisions are most appropriately taken. The essence of good organisation, as I have already said, is to ensure that every decision is taken at the lowest level where it can be effectively taken. *And the essential point is that decentralised decisions cannot be well taken unless they are based on sufficient understanding of the central purpose.*

That covers the first point, and as to the second, if all who work together in a firm from top to bottom understand *how* the machine works and *why* certain things have to be done if it is to work properly, and if they can see that, when authority is exercised, it is exercised not in an arbitrary way (merely because someone on the "bosses" side wants to show his power) but for a good reason (because the "law of the situation" demands it), then the foundations will be rightly laid for an orderly co-operative effort.

It is easy to state ideas of this kind on paper and I suppose they would be generally accepted ; but, having stated them, I am left with the unsatis-

factory feeling that they do not carry one very far and that the crucial problem is to find methods for applying them in practice in such a way as to create true spontaneous co-operation. It is when one studies actual practice that one begins to see the difficulties and to realise that those who start on this course are entering unknown country and are still groping to find the right way through it.

This leads me to another point which I specially want to emphasise. *We need more factual knowledge and less theorising.* A great number of interesting developments and experiments are now going on in British industry. What is needed above everything at this stage is accurate observation, record and interpretation of these things that are actually happening. I should like to see more case history studies based on first-hand evidence and less of that vast volume of literature which is being produced by people who at second or third hand know something *about* the kind of things that are happening but are not actually handling them. It is those who are actively concerned with the practical conduct of industry who could now make the most valuable contribution. They should do more to record, interpret and publicise the results of their own experiments and experience.

We are indeed now beginning to get some literature which is valuable for the purposes which I have in mind. As a case history study, there is Sir Charles Renold's book to which I have already referred and which I believe to be just the kind of study which is wanted. I want also to mention two projects sponsored by the Panel on Human Factors of which I was Chairman. The first is one to which I have already referred—the broad survey of joint consultative methods which are actually in use in British Industry which has just been completed by the National Institute of Industrial Psychology. The report on this, will, I hope, be published in the near future. The second project is an intensive examination, carried out over more than three years, of how joint consultative methods have been developed in an engineering Company employing about 1,500 people—the Glacier Metal Company. This follows in great detail the record of how problems have arisen from day to day and how they have been met, and the results are recorded in the recently published volume by Dr. Eliot Jaques of the Tavistock Institute under the title of "The Changing Culture of a Factory". I believe that both these studies help to bring out valuable lessons.

I shall not attempt now to give any full appreciation of the conclusions to which these and other studies seem to lead. Indeed it follows from all that I have said that it is impossible at this stage to reach final conclusions. We are in the stage of groping to find the right way towards a goal which is still far away. And, anyhow, human situations are live—dynamic not static—always changing and growing. But it may be worth while to record a few provisional impressions which have significance for the final points which I want to make.

Observation of what is actually happening reveals many difficulties. Perhaps the greatest of these is apparent apathy among the rank and file. There tends to be a live interest in committee meetings when some subject of acute concern to all is in the air (for example the handling of a "redundancy" problem such as occurred in the latter half of 1949 before devaluation) ; but in ordinary times there is considerable apathy.

This is linked with another kind of difficulty. If a full measure of joint consultation is genuinely tried, then committee meetings take up much time and involve a very real sacrifice for those who serve as committee members. If their constituents take little interest in their efforts, that is not only discouraging for them, but also makes their task of "reporting back" extremely difficult, with the result that the general body of workers remains uninformed.

Another difficulty is that useful discussion in committees, especially when such matters as financial policy have to be considered, requires a higher level of education and technical understanding than is at present always available.

Then again the workers' representatives are by no means always ready to welcome the chance of sharing in the responsibility for decisions. A not uncommon reaction is that management is trying to unload its own proper responsibilities on to the workers' shoulders.

I do not think we should be discouraged by any difficulties of the kind I have just mentioned. They are natural symptoms in the first stages of what is really a revolutionary change requiring entirely new outlooks. If attempts to devolve and spread responsibilities were always to be held up until the new shoulders were fully ready to receive them, there would never be any progress at all.

I turn from this to a difficulty of another kind which involves a complexity of issues and which has, I believe, great significance. If a firm is trying, through methods of joint consultation and otherwise, to weld all its members into a co-operating community, the question arises whether the internal loyalties thus created may be in conflict with the workers' loyalty to their Trade Unions. It is no use shirking this possible difficulty. It must be faced. I am certain it can be overcome. But it leads me to urge most strongly on the one hand that any firm which wants to progress along these lines must work in close harmony with the Trade Unions concerned, and, on the other hand, that the Trade Unions should take an active interest in these ideas of joint consultation and lend their support to all concerns that are genuinely trying to move forward towards this conception of industrial democracy.

I have said that this is a complex issue, and in saying that I had in mind amongst other things that it links up with Sir Charles Renold's point about recognising one and the same body of workers' representatives both for negotiation and for consultation. I realise that there are many difficulties to be straightened out—and I cannot attempt now to explore all that is involved. What I do want to do is to emphasise my view that one of the most important conditions for success in developing the whole idea of self-government in industry, as I have defined it, is that it should have the realistic interest and genuine support of the Trade Unions.

There is one last point of great importance which seems to emerge from the study of developments at the Glacier Metal Company over the last years. I read that experience as indicating that the purpose of joint consultative methods has come to be accepted more and more as that of getting agreement on general lines of policy with a recognition that the *execution* of that policy is a responsibility of management; and that management will not be doing its job properly if it tries to unload this part of its responsi-

bility on to the workers by bringing them into consultation on every occasion. That is perhaps an over-simplification, and I certainly would not take it as excluding the idea that the manual workers should have the chance to express their views as to the way in which their daily jobs are handled; but I believe there is a core of truth in the general idea as I have stated it, which is of the greatest significance. It leaves the way open for the necessary exercise of authority and, indeed, I read the Glacier Metal experience as showing that courageous efforts to create real participation do not lead to a weakening of authority but rather to a strengthening of it by securing general acceptance for its proper exercise.

Finally, I want to note that the general idea as I have just expressed it embodies a much broader conception than that stated in Mr. Gunter's speech which I quoted in my opening remarks.

SUMMARY AND CONCLUSIONS

It is time for me to close.

I am fully conscious that you may think I have spent most of my time in talking round my subject and that I have brought in many extraneous issues. But I have done that deliberately because I believe that this ideal of self-government in industry as I conceive it cannot be attained unless the whole set-up is right and unless a great number of connected practical arrangements are rightly handled. Apart from this I have wanted to emphasize that if we are genuinely to seek this ideal we must realise that we are starting on a course of revolutionary change involving an entirely new outlook and that we must have the courage to go through with it. I have wanted to emphasize too that this course is one on which we have to grope our way, learning by experience as we go. Those who take the pioneer steps will make mistakes and meet with many disappointments. The important thing is that their experiences should be recorded and interpreted so that the whole of our national industry may benefit from them. And there is one thing which I must add. I have been reviewing the problem chiefly in terms of the responsibilities of industrial *management*, and this is natural because the initiating responsibility chiefly lies on that side. But management can achieve nothing without a proper response from the workers' side and, as to that, I have particularly emphasised the need for constructive action by the Trade Unions.

In conclusion, I want again to emphasise that the issues which I have been considering have a significance extending far beyond the industrial sphere. They affect our whole order of society.

It is a commonplace to recognise that the great problem of Western Civilisation today is to resist the threat of dictatorial Communism. We cannot do that effectively unless we can make a success of our own society. There can be no success for an industrial society—such as ours essentially is—if conditions are such that the great mass of workers can find happiness only in escape from their breadwinning work. They must be able to regard that work as affording at least the foundation for a worthy human life. I believe that the fulfilment of that condition depends largely on our being able to work towards the aim which I have stated this afternoon—the aim of creating within each industrial unit a live co-operating community working together freely for a common purpose.

The Employment of the Older Worker

by SIR FREDERIC BARTLETT, C.B.E., F.R.S.

Wednesday, 17th October, 1951

IT WAS, I believe, a part of the original purpose of these lectures that they should bring out various points of contrast between the industrial problems and practices of the year of the Great Exhibition of 1851, and those of this year of the Festival of Britain. From that point of view, at least, my task is a relatively easy one. A hundred years ago there was in this country no widely recognised social problem concerning the employment of the older worker. No doubt there must have been plenty of people then, as there always have been, who were worried about what was likely to happen to them as they grew older, and there was some, but not very much, philanthropic interest in the problems of ageing. But the social conditions which make questions of the industrial employment of older workers a matter of general and urgent public importance had not yet been realised.

Nevertheless the movements which were destined to produce the position which we are face to face with today had already begun, and the Great Exhibition itself must have contributed to their development in no uncertain manner. It was planned largely to illustrate the industrial efficiency, resourcefulness and inventiveness of the people of Great Britain. It accomplished its aims to a superlative degree, and in illustrating these qualities no doubt greatly reinforced and strengthened them in a world which was already the scene of fierce industrial competition. Any large community whose success depends principally upon its contribution to the general economy of productive industry must sooner or later take steps to see that it has a constant and continuing supply of young people, who are approaching the flower of their life in health, energy and intelligence and with a spirit of adventure.

The movements for the medical and social care of the young child which have proceeded with increasing momentum, especially during the later portions of the last hundred years, have no doubt been due in large measure to philanthropic concern. To the philanthropist the helplessness of the infant is apt to appear a more worthy object than the helplessness of the aged. But we must not forget that they have also been an urgent practical necessity. They can be ignored by no national group which sets out to achieve or maintain an important place in an industrialised world.

When, in any population, the young become relatively more healthy the old will become relatively more numerous. I don't know what proportion of the population of England and Wales was 60 years or more in 1851. Fifty years ago it was 10 per cent. Now it is 15 or 16 per cent—a fifty per cent increase in this age range; and the rise will inevitably continue. Let us not forget that a healthier young population is also almost certainly more intellectually alert, and that in this respect also the older elements will change in the same directions. The potential older working population of today is relatively keen and alive, vocal, and as is natural, more actively concerned with its own interests.

In 1851 in this country, and for long enough afterwards, there was normally a large labour pool, into which workers must go when they were not wanted, and from which they could be drawn when they were wanted. Some occupations contributed more, or with greater seasonal regularity, to this pool than others, but most of the occupations in common demand were usually fully represented. A planned industrial economy and the deliberate adoption of a policy of full employment have changed all this, as they have many other things also. Already there is no large pool of reserve labour for any of the larger industries, and it seems very unlikely that there will ever be again.

One other point in particular we should bear in mind when we are making these comparisons between the position in industry today and that of a hundred years or so ago. Then a very much less healthy young population began its industrial life at a very much earlier age. One result of this was certainly an earlier, steeper and more general decline of industrial efficiency. It has often been pointed out that on the whole it is easier to change public practice than it is to change public views. The practice of the day may be principally determined by rules and laws that have been made or passed only a short time before. But the current conventional views about the kind of people who carry out or are affected by the practices usually go back a long way and stay without much change over several generations. When age is in question this does not matter if the older worker is identified in terms of his behaviour, but when he is defined as anybody who is approaching an age limit which was conventionally fixed generations ago—and this is, on the whole, what is being done today—it may be exceedingly misleading. The time has come in fact when we must know all that can be discovered about the kinds of behaviour that are characteristic of broad age-range differences in the current population and whether they are inevitable or merely due to environmental conditions which could readily, and with advantage, be altered. Nobody with knowledge can doubt the fact that when we speak of "the older worker" we still think of somebody who is, in a general way, in or approaching a period of decline of most of those human capabilities which industry demands. That would have been right in 1851 ; today it is definitely and even disastrously wrong.

One more general point must be mentioned, and then we can proceed to a statement of the facts about the industrial significance of ageing, in so far as they are known, and to such tentative conclusions as seem to be warranted.

In our country, and I think in every other, it has always hitherto been supposed that the school leaver who is looking toward industrial employment, will as early as possible be given training for the career of a life time. Naturally there are always plenty of individual instances in which this does not happen, and early training does not fix the lines for all subsequent achievement. There is perhaps some evidence, but I do not know of any available reliable figures, that exceptions of this sort have increased greatly in recent times. But still in a large statistical sense, and in terms applicable to extensive training schemes, it is still assumed to be the normal occurrence. For all that, this may have become a wrong notion. Supposing that there is good evidence that as the bulk of people approach, let us say, middle age,

there is no regular and general decline of capabilities, but there are changes so that some forms of industrial employment become less economical and others more ; it may become not only sensible but necessary to contemplate a normal life of two or more careers, with appropriate retraining at the proper times. Almost all our current ideas about training, and almost all planned training schemes, are adjusted to meet the interests and capacities of young people. But if there are these changes they will affect training as much as they will influence subsequent employment. I do not say that the complete evidence is as yet available, but there is some evidence that tends to show that the current acknowledged custom in this respect is mistaken. Speaking for myself, at least, I should not be surprised if in the reasonably near future the notion of the multiple industrial career, with shifts of occupation or of occupational practice at appropriate age-ranges, becomes a part of the industrial programme of every vigorous and successful national group, and a part also of the expectation of the worker.

Enough of these general observations ; let us turn to some relevant and established facts. About six years ago the Nuffield Foundation, through its medical committee, made an extremely generous offer to the University to establish a Unit for Research into Problems of Ageing at the Cambridge Laboratory of Experimental Psychology. The offer was gladly accepted. From the outset it was clearly understood that we were not going to be concerned to try to find out how to increase the normal span of human life, or how to ameliorate the disadvantages of extreme old age. Our plan was to keep closely in mind the contemporary problems of industrial organisation and practice in this country. We thought it likely that our principal concern would be with the middle and late age-ranges of normal industrial life, say from the early 40's to the early 60's, up to and perhaps a bit beyond the accepted retiring ages of 60 and 65. Later the work of this Unit was reinforced by interest and support from the Human Factors Panel of the Government-established Committee on Human Productivity, and that part of the enterprise has now been taken over by the Medical Research Council.

Most of what I have to say will be based upon the work of this Unit. I cannot mention by name any of the research workers, but I must pay tribute to all of them for what they have so far done and for their promise for the future.

Most of the work which had already been done on the effects of ageing upon behaviour was dominated by the idea that the chances are that older people are worse at doing things than younger ones. So they are, if the right things are chosen. Vision, hearing and the other senses begin falling off a bit, usually round about the late twenties, and so does the speed at which simple movements can be made to order. But no industrial worker (or for that matter none of us, industrial or not, in daily life) lives by vision, or hearing or any of the other senses alone, or by making simple movements to order. The senses are used in the service, not of single, simple movements, but of sequences and orders of movement required to achieve some task such as driving a car, or winning a game, or producing some article or part of an article required by the community. And these orders and sequences of related movement have got to be done, not once only, but

over and over again, in constantly changing circumstances, throughout the whole of the working day, for long stretches of the working life. To measure or assess real industrial performances we must learn how to get right inside them, to relate the amount produced or the energy expended to the number, and timing, and direction of the moves as these are in fact made in their natural sequence. For example, a slowing up of the items of movement may, within limits, be of little significance if fewer movements have to be made ; a reduction of keenness of sight or hearing or any other senses that are used in the identification and interpretation of signals for action is equally of little significance if more, or different, signals become available. So our very first task was to try to achieve significant measures of industrial skill, not in terms of its separate items, but in terms of actual, complex, and realistic behaviour.

This is no time or place for me to attempt to describe in detail the technology of the new methods for measuring and assessing industrial skill that have been achieved. They are in their way as specialised and technical as contemporary methods of medical or surgical diagnosis or as tests for the strength and durability of basic materials. For the present I must ask you to accept the fact that new measurements and methods of measurement have been developed, and go on at once to show what is the picture that they give us of the older worker.

First there is no doubt whatever that for all manner of skills, from simple combined bodily movements to complex high-level mental skills requiring executive and administrative decisions based upon evidence collected from many sources, the overall preferred speed of work diminishes as age increases. The indications are that this normally sets in in the late 20's or early 30's ; that there may then be complete or nearly complete recovery again up to somewhere in the 50's ; and after this, rather slow decline but, special disabilities apart, nothing catastrophic until well after normal retiring age. It should be noticed that I have spoken of decline in *preferred* speed. There need be no fall in actual speed, if the conditions of work themselves set the rate ; but the cost of maintaining this, unless the methods of work are changed, may become much more punishing, especially from the 50's onwards.

Yet it is easy to be misled by this, and many people have been. Identically the same result can be produced by many moves at high speed or by fewer moves at slower speed. To adopt the latter style seems to be the natural protective mechanism of the body and mind that are growing older. The real trouble arises in that large class of contemporary industrial operations which have to be carried out to an imposed rate of speed, and the rate is set, as indeed it usually is, by operators in the 25-35 age-range. This happens, of course, where the operator must keep up with a machine or a conveyor line, where each cycle of an operation must be completed in a fixed time and where there is little or no chance to correct errors of omission. But speaking generally even this need not be serious or intolerable unless the imposed rate of work is also associated with continuous high speed bodily or mental agility. Both our experiments and our field surveys show this as a definite contra-indicator for the bulk of workers from the middle 40's upwards.

We must break up this speed stress situation, critical for the older worker, a little more. Practically all human performance has two outstanding aspects. It is initiated and guided by signals which come from the environment—it may be from machines and their accessories, or from the free world—and which must be identified and interpreted by the senses and the mind. It is expressed in bodily movements, or in decisions, or in both.

Let us look at what the signals do, keeping to our speed stress situation. It will be found that when signals succeed one another rapidly the worker's senses naturally soon run on a little ahead of his actions. He will be doing something in response to a signal that has passed, and interpreting a signal that has not yet arrived at action point. We know now that this anticipatory action of signals normally makes no important difference to the worker's reaction-time, and it does not increase the actual speed of movement or decision. What it does is to fit together the movements within their sequence so that one flows into the next smoothly and with minimal effort, and potential fatigue is lessened. The main secret of arranging the display in any machine directed industrial operation lies in so controlling the succession of signals as to give the greatest chance to the greatest number of smooth and well timed actions. It is almost certain that the optimum rates must be adjusted to broad age ranges.

Experimental results show that there is another characteristic of ageing, apparently beginning to appear normally in the 30's and again becoming more important later. This is a predisposition on the part of the older worker to look more at whatever he is doing relative to its signals, and to trust less to "feel".

Very likely this is a part of the general slowing up, but it seems to have another and a much more important result. The direct anticipatory action of the senses is severely limited as to its range. It can work one, two, three, but rarely more, steps ahead in a succession of signals. In practice it quickly comes to be supplemented by the kind of memory which uses the past to push action towards the future. The great bulk of industrial operations have some kind of recurrent signal system. The cues for action possess order and arrangement and these obviously have no limits of time but remain effective as long as they remain consistent. Anticipated order and arrangement works precisely as direct sensory anticipation does, producing accurately timed, smooth and economical action. The cost is, however, obviously a reduced flexibility.

It seems likely that the direct sensory anticipation span, or range, of the older worker in practice tends to retract somewhat, but at the same time his tendency to use the order of the past to dictate or guide the action of the near future increases. At any rate it is quite certain that the capacity of the older worker, particularly in the 60's and upwards, to deal quickly and adequately with new arrangements of incoming signals is markedly reduced in working conditions, though it need not appear to be very much affected if a special and isolated test is given. But he maintains unimpaired, and perhaps with increased ease, any operation which follows the direction of signals that have a well established order and arrangement. In psychological language it seems that, unless special precautions are taken, recall comes gradually but surely to predominate over alert, moment to moment observation.

When we turn to the movements and decisions themselves which are demanded by skilled industrial performance, we find nothing at all dramatic as age increases. We find, as I have said, some slowing up of preferred rates. It seems reasonably certain that the retardation is not in the reaction time (the interval between the occurrence of a signal and the beginning of action) and not in the speed of movement or decision, but in the waiting time between one move and another in their natural sequence. Some of the evidence suggests that there is lessened sensitivity for the information that comes from movements themselves while they are being made, and if so there must be some reduction, or change, of central nervous control. But for the fit man there seems—apart from the one case that I have already mentioned, where imposed speed stress must be combined with general bodily activity—to be no drastic change until really advanced age on the executive side of skilled work. Even the common belief that the older worker is less tolerant of heavy physical effort is not borne out by the evidence, though many of the forms of such work are accompanied by extreme environmental conditions such as great heat, or cold or humidity, or noise, or atmospheric variations, and it may be—we don't yet know—that the normal ceiling for these is reduced in late middle age.

We must look briefly at the learning processes of the older worker. There are many reasons which inevitably make the serious and scientific consideration of these a matter of great importance. Even though there is little that the older worker cannot do if he is put to it, unless far more care is taken than ever has been yet with the design of the displays and controls of industrial operations, the price is increased strain, an intermittent kind of effort, concealed anxiety which sets the stage for accidents and illness, and in the end lowered productivity. Apart from this already the discovery of new materials, new processes, new sources of power can rapidly displace very large established operations, and almost certainly the pace of such inventions and discoveries will increase. The general trend all the time is to move away from the heavy, laborious task to the more skilled, relatively light machine-directed operation. Let us make no mistake about one thing. There is still a frequently vocalised view that the predominantly machine skills of modern industry are somehow less skilled than the old, traditional types of craftsmanship. It is a vulgar error. They are different ; they are not less. Never were the conditions of work more fluid, more changing, more likely to be revolutionised by new scientific discovery than they are today. These are the situations which, as we have seen, present the older worker with his most difficult problems.

We know a lot about the learning processes of animals and young children ; a little about those of adolescents and young people ; almost nothing about those of middle age. We know definitely a few things. The pace of learning of the worker in middle age will normally be slower initially but usually with greater acceleration later. It is probable that he will be more likely to identify errors made and also that mistakes made during learning will spontaneously recur with greater persistence later, especially when the circumstances are difficult. It seems that younger people learn quickest and best through directed exercise, but middle age requires a more rational approach, with greater stress upon principles, orders and patterns of arrangement of display signals. The great natural

danger of all human learning, unless special precautions are taken, is that what is acquired becomes so tightly tied up with the original conditions, that there is delay and waste in adaptation to new ones. This danger is at its greatest in the middle and later age ranges. All of these, however, are general points only, yielding little guidance for specific circumstances. There is no problem of the older worker that is more urgently in need of well considered and directed investigation than the problem of how he learns.

What I have said is the result of a combination of laboratory experiment and field investigation. It was obvious that we must attempt the latter, first to see to what extent the laboratory suggestions are borne out in actual industrial experience and practice, and second to collect and analyse a wide range of statistical records ; for without the evidence of these it is unlikely that points of policy in regard to the older worker will ever win wide acceptance. Once our aims have been explained and understood we have met with nothing but courtesy and a welcome from all sides in a wide and diverse group of industrial organisations. In a general way the experimental results are confirmed beyond any possibility of doubt. In many operations which are at present planned to be carried out at imposed and uniform speeds, the working population is skewed strongly in favour of workers in the 25-35 age range. Change of industrial occupation in operations of this type is to a significant degree more frequent after the late 40's. While it may be said that if a skilled operation is learned early in life, given continuing good health, that operation can generally be maintained economically until well past the normal retiring age, there is also plenty of evidence to indicate that when important changes in the conditions or material of work develop, and re-learning, or new learning, becomes necessary, with present training methods the older worker is at a definite disadvantage. Such changes of condition are much more common now than they were a few years ago, and will become more frequent still.

Yet, though we may feel that statements of this kind are safely made, the actual industrial records on these and all other matters affecting the older worker are lamentably weak and fragmentary. We cannot decisively tell how much of these general phenomena are really due to increase of age, and how much are due to a longstanding traditional belief that the older worker is all the time inevitably becoming less economically effective. Two things are needed : well-directed field experiment, and equally well-directed systems of industrial record. These are industry's own jobs. The sooner it undertakes them seriously the better it will be, for itself and for the whole country.

To what tentative conclusions, to what suggested lines of policy does all this lead ?

So long as we pay chief attention to the available evidence the implication is that the large majority of a contemporary healthy population can continue efficiently and economically to meet the main demands of industry at least up to the limit of what is still taken to be the normal span of life.

If there is any serious trouble it will be with speed, and especially imposed speed. For the worker in or approaching the upper reaches of middle age,

high rates of imposed speed which must be combined with considerable bodily agility are a definite bar.

Short of that, in an age when more and more processes become machine directed and when improvements in machine design are largely dominated by attempts to increase economical running rates, imposed speeds themselves may cause special difficulties for older workers. These difficulties are often increased by some of the modern forms of bonus incentive. They cannot be removed by regard for what are called "human relations", or by systems of management alone. Both may help ; but the basic requirement is to plan operations, and especially the design of display and control, with a view to the most widely distributed natural range of abilities in whatever working populations are concerned, and in doing this to make age-group an important consideration.

If this is done, and I am myself quite certain that it will have to be done, it will make the problems of reorientation, re-learning, and perhaps occupation switch in the more advanced age-groups, acute and critical.

As I see it, there are no insuperable obstacles to such an extension of planned occupational design. It needs good-will and instructed intelligence on all sides, but they are there. It can be achieved. Is it worth while ?

This is a question of policy and as always there is room for more than one view ; only the exigencies of a single lecture must compel me to appear dogmatic.

A high rate of industrial production is now a matter of life or death for every large and active nation or community. There is still far too great a tendency to think of enhanced productivity as a problem of spurt, and we have particular and obvious temptations to think in that way just now. But the need is not to be treated as the continuing result of two world wars and the added fear of a third. Whether the future is peace or war will make a difference only to the direction of production, not to the stringency of its demand. For the demand is based fundamentally on the increasing needs of humanity. Those needs can be met, I am sure, only if all fit people, from youth to age, play their parts, and only if those parts are planned in accordance with the natural flowering and growth throughout life of human abilities.

The Human Factor in Accident Prevention

By PROFESSOR T. U. MATTHEW, Ph.D.

Friday, 23rd November, 1951.

(Sub-headings have been added for reference purposes)

IT IS a great honour to have been invited by the Minister of Labour and National Service to give this talk in the Centenary Series on the Worker in Industry. Other speakers have dealt with social and national aspects, and Professor Lane has already spoken on the effect of environment on the health and efficiency of the industrial worker. It is appropriate that we should at this point turn our attention to another topic of direct importance to the worker, namely—The Human Factor in Accident Prevention. This is a subject which might have been taken up equally well from the point of view of the medical research worker or the industrial psychologist. I propose to deal with it as a production engineer concerned with finding a practical solution to a major problem. I shall review first of all our progress during the past 100 years towards safe-guarding the industrial worker ; secondly, the cost of industrial accidents ; thirdly, the human factors with which we are concerned in accident prevention ; and fourthly, I shall outline the possibilities in the different methods of organisation for accident prevention.

A CENTURY OF PROGRESS IN ACCIDENT PREVENTION

The period 1851-1951 has been a century of progress in this country. In the industrial field, this progress has resulted from wide-spread developments in science, in invention, in industrial organisation and, finally, in the application of medicine and of new concepts of social welfare, which have improved the conditions for the worker in industry.

During this period, the population of the British Isles has increased from about 15 million to 50 million people, and the working conditions and the real wages of every worker in industry have been improved out of recognition. At the same time, the average length of the working week has decreased from over 70 hours to about 44 hours, and a greater part of the fatiguing manual effort previously required has been replaced by mechanical power in most industries.

This social and economic progress has been made possible by the development of over 250,000 industrial factories, which furnish most of our "National Product" of wealth, and which today employ a total of over six million workers.

This is a major change, compared with the predominantly agricultural economy of over a century ago, but it is a change which has brought new responsibilities to manager and worker alike, for both our standard of living and our strength in National Defence potential has become dependent to an increasing extent upon manufacturing industries.

One of the most hopeful signs in our progress during the past century has been the steady development of our British system of factory inspection and the gradual evolution of a sound body of statutory regulations covering

all aspects of working conditions, health and safety, the guarding of machinery and the reporting of accidents and of dangerous occurrences.

The results of this long continued attention to the safety of the worker in industry are seen in the greatly improved conditions of our modern factories and in the improved safety and health of industrial workers today.

Present industrial conditions are in marked contrast to those prevailing 100 years ago. At that time, Her Majesty's Inspectors of Factories were concerned with problems which have almost ceased to exist today, owing to the change in our social and industrial habits. The Factory Act of 1844 with its far reaching provisions limiting the employment of young people for cleaning and moving shafts and machinery and requiring the secure fencing of fly-wheels, belts, gearing and other moving parts had just come into effect. In addition to seeing that the provisions of this Act were brought into use, Factory Inspectors were also engaged in such tasks as assisting factory managers to reduce the high incidence of death from cholera by improving the sanitation in factories. They were also concerned with the inspection of the very inadequate schools for young children, who were at that time commonly employed in many factories.

The British Factory Acts and Factory Inspectorate are both regarded as a world model, and the carefully built up traditions and safe practices embodied in our Factory regulations are finding application in most countries today, following upon our example. While it is true to say that during the past century we have made outstanding progress towards accident prevention, this success has not been easy. The resistance to change which exists at all levels in industry has been, and still remains, the major human factor which, in this instance, has had the effect of causing legislation to lag far behind the investigation of dangerous or unhealthy working conditions. Even today, apathy, indifference and suspicion make it difficult for management and workers to co-operate effectively in the introduction of new and improved safety measures. Much work has yet to be done to ensure that a continuous process of change for the better is accepted at all levels of industry as part of our industrial tradition.

During the last thirty-five years greatly increased attention has been given to the human factors involved in industrial accidents and ill-health. The work of the Industrial Fatigue Research Board in the first World War was a mile-stone in British progress in this field. At that time a great impetus was given to the application of scientific methods to investigation and research on accidents and ill-health in industry, and this impetus has never been lost. It has indeed been steadily growing through the influence of the Medical Research Council and many other bodies directly interested in studying the human factor in industry. During the same period industrial managers, production engineers and tool designers in their daily work in industry, have been successful in devising a great variety of mechanical and electrical guards and safety devices for every kind of power unit and machine tool which have proved of great practical value in accident prevention. We have thus over the years accumulated a vast store of knowledge on the effects of the working environment on the health and safety of the worker and on methods of safeguarding workers using machinery of every description.

We are now faced with the further and more difficult human problem of ensuring the full application throughout industry of the results of these years of research and "safety engineering". This is a problem in co-operation and organisation to which I shall refer again later.

THE COST OF INDUSTRIAL ACCIDENTS

We are interested in the prevention of industrial accidents firstly as a means of reducing human suffering and loss, and secondly as a means of reducing the loss of productive time and damage to equipment to a minimum. It is impossible for us to assess the full cost of human suffering, and the monetary compensation for accident disability based upon loss of earning power is no measure of the suffering entailed by the injured worker. The human being is highly complex and sensitive, and the shock *both mental and physical* of an accidental injury can never be fully assessed. Furthermore, the human suffering caused by the industrial accident may often extend beyond the person immediately involved to those closest to him in the home or factory.

My attention has been drawn to a recent case where a father and mother suffered disability accidents in succession, only a few days after their son suffered a serious accident in the same factory. The total cost of human suffering in these cases is beyond our human powers of assessment.

The extent of suffering and loss to be expected each year can be pictured more clearly if we summarize in round figures the accident statistics in terms of a typical British engineering works. A recent survey¹ showed that for every 1,000 workmen employed in such a works, accidents occur on average as follows :—

every day—10 new injuries receive surgical treatment and 40 to 50 minor injuries occur.

every week—1 serious accident will cause a loss of 10 to 20 days.
(really every 12 days 20-30 days on average).

every 2 years—1 major accident will cause permanent and serious disability.

every 10 years—1 fatal accident will occur.

This is a dreadful anticipation and our sense of social responsibility impels us to strive to reduce this incidence by every means at our disposal. Taking the National picture as a whole and basing upon the Ministry of National Insurance statistics, the lost time due to industrial accidents amounted to nearly 30,000 man-years last year, in the main industries which employ about 40% of our total labour force. The estimated reduction in National output as a result of this lost time amounts to at least £17 million per annum.

An analysis of the total cost of an accident made from other sample studies indicates however that the major part of the cost arises from the loss of time caused to people other than the injured person as follows :—

¹"Industrial Injuries," J. M. Bull, *British Medical Bulletin* 1950, Vol. 7, No. 1-2.

Cost of time lost by the injured worker	15%
" " " other employees giving assistance or curious	36%
" " " foreman and other staff	25%
" " spoiled materials and tools	6%
" " compensation and medical aid	18%
	<hr/>
	100%

It is thus necessary to multiply the direct loss to the National Product by at least six fold to arrive at the total cost to the nation of time lost by workers suffering accidents. This is a conservative estimate, however, and if we take into account the disruption of normal working during the shift due to minor cuts, bruises and falls, and consider the effect of all such accidents on the subsequent performance of the persons involved, the total loss to the nation of accidents in the mining, manufacturing and building industries may well be in the region of £100 to £150 millions each year, which is equivalent to a loss of £10 to £15 per employee per annum.

It is against this figure that we must measure the cost of the organisations which we have set up nationally, and in individual firms to conduct research and to instruct managers and workers in methods of accident prevention.

THE HUMAN FACTOR IN INDUSTRIAL ACCIDENTS

Great progress has been made towards the safeguarding of industrial workers by means of protective clothing, footwear, gloves, aprons and eye shields, and by means of machine guarding and safety devices and by training in safe working methods, and this progress is reflected in a reduction in the incidence of industrial accidents over the past half century. Nevertheless, in spite of all existing precautions, 192,000 industrial accidents occurred in 1949, of which 772 were fatal.

These figures are a challenge to everyone concerned in providing safeguards and in devising safe working methods, but it is also important that we should try to find out the real underlying causes of these accidents by continuous study and research. Detailed analysis of accident causes have shown ¹ that only 20% of industrial accidents are the result of mechanical or electrical breakdown, failure of equipment, or the lack of machine guarding. The great bulk of accidents are the result of faulty judgment or lack of care on the part of the individual concerned or of others. Much useful information on the human factor in accident causation has been derived from studies of the statistics of accidents and from research work carried out in factories in recent years. Most of this information has been published in the reports of the Industrial Health Research Board and elsewhere, and it indicates the general direction in which we must aim in devising new and improved methods of accident prevention.

This research work—although not more than a beginning—tells us a great deal about the interaction between the worker and his environment.

¹H. M. Vernon in *British Journal of Industrial Medicine*, Vol. 2, No. 1, Jan. 1945.

Not only is the working effectiveness and output of the worker affected by abnormal physical conditions of temperature, humidity, lighting and noise, but it is also affected by the working pattern to which he conforms, or which may be imposed upon him. This working pattern is composed of the hours of work, the provision made for rest pauses and refreshment ; the socially accepted normal and incentive working pace ; the type and length of training given ; the social or group attitudes to the job ; the accepted methods of performing the details of the task ; and so on.

All these factors interact with each other and also with the individual worker's basic and developed human characteristics. Individuals are found to vary greatly in their physical and mental abilities, to see and think quickly ; to use their hands accurately and dextrously ; in their natural strength and stamina ; and in temperament ; they also vary greatly in their ability to learn to use tools and complex equipment, to hear or to read and to follow instructions, and most of all, in their ability to learn from experience.

Dr. H. M. Vernon, one of our leading British pioneers in research on accident prevention and other workers in this field have shown that there is a direct co-relation between many of these factors and industrial accidents.

Taking only a few examples from the studies which have been made :—

(a) *Effect of Temperature*

Vernon and Osborne in 1922 reported the results of an investigation which showed that there was an increase of 30% in accident frequency in factories when the room temperature fell to about 54°F or rose to 80°F, the minimum frequency of accidents occurring at temperatures between 65° and 69°F. Further statistical studies on accident frequency in coal mines showed that the temperature effect was also related to age. These later studies showed that there was little difference in accident frequency between 25 and 55 years of age, as long as the working temperature did not exceed 70°F. At temperatures above 70°F, however, there was a marked increase in accident frequency with age, men of 55 having a 50% greater accident frequency than the 35 age group, in which the minimum frequency occurred.

(b) *Effects of Hours of Work*

Vernon also obtained some important data from his statistical studies in munitions factories which showed the effect of length of working day upon accident frequency. He showed that the relative accident frequency was 14% greater for men and 27% greater for women when working on a 12 hour shift compared with a 10 hour shift. Comparing the accident rate in the morning and afternoon showed that on the 12 hour day, the men's rate increased by 7% and the women's rate by 45% in the afternoon, while on the 10 hour day, the men's rate increased by 8% and the women's rate by 17% only. When the same workers were on night shift for 10½ hours, it was found that the accident frequency was actually more uniform throughout the shift, and lower on average than the 10 hour day shift frequency rate.

(c) *Learning ability and experience*

One of the most important human factors affecting accident frequency is the learning ability and experience of the individual. It is difficult to

separate these two factors but in the Annual Report of the Factory Department for 1937, evidence is given showing that for a group of boys and girls entering factories, their first 6 months employment showed that 50% suffered accidents, in their next 6 months 25% suffered accidents, but after 2 years experience, less than 3% suffered accidents in subsequent 6 months periods. It has also been shown that careful selection of employees, followed by induction training in safety precautions and rules, and proper supervision during the early period can halve the accident frequency among newcomers. The first few weeks in a new job are the critical period for all ages of newcomers incidentally.

(d) *Accident Proneness*

Much research has been directed towards studies of individuals exhibiting "accident proneness", particularly during the recent war, when selection testing procedures were developed and used extensively in industry and the Services. "Accident prone" individuals appear to be unresponsive to the external stimulus of changes in the working environment and thus suffer repeated accidents. Individual workers giving any indication of "accident proneness" should therefore be placed in jobs which contain the minimum amount of hazard and accident risk.

These research studies show us clearly the interaction which exists between the worker and his environment, and the examples quoted are only a small part of the great body of information which we possess today as a result of many years of careful research on factors affecting accident frequency. The revised Factory Act of 1948 incorporates part of this knowledge in the various provisions made for lighting, temperature control, and ventilation, in addition to the safety provisions applying to the fencing of machinery, eye protection, training of young people and so on.

In addition to research studies of this nature, a great contribution to knowledge on accident prevention has been made in recent years by production and work study engineers in individual companies. They are concerned with practical studies of plant layout and of machinery and tool design, not only with the object of increasing productivity by reducing the human effort and fatigue involved in the task to a minimum, but also with the object of devising working methods and motion patterns which are inherently safe to use. Unfortunately, much of this type of information has not yet found its way into print and present methods of communicating it are still inadequate.

The forthcoming safety training course for Power Press Tool Setters which is to be held at the University of Birmingham during December, by the Birmingham Safety Group in co-operation with the Midland Advisory Council Panel on Industrial Accidents, and which will be attended by over 150 press tool setters, should be a useful method of imparting specialist knowledge on accident prevention.

During the recent war, a considerable amount of research work was concentrated on the physical and mental characteristics of workers and service personnel who were required to work or use complicated equipment under abnormal conditions of temperature, pressure accelerations, black-out, fatigue, etc. For example, the Cambridge "Cockpit" has become

famous as a method of studying the reaction times and responses of pilots to signals and indicators.

A new society has recently been founded called "The Ergonomics Research Society", to continue this type of scientific research and to co-ordinate the work of the production engineer, the physiologist and psychologist and the anthropometrist, in the scientific study of the economics of human effort, known in the United States as "human engineering". This is of great importance in accident prevention, since it is essential that the incentive task should be set and agreed at a "safe" level. Similarly, if ergonomic studies show that the operator makes a greater number of errors when the control lever has to be moved in the opposite direction to the indicator needle in a dangerous operation, then it is essential that they should both be arranged to move in the same direction to avoid confusion and accident.

The importance of this work is underlined by the estimate that every year more than half the accidents occur owing to what is termed "lack of care" in using hand tools, or in handling materials or in walking about. A great deal of fundamental "ergonomic" research still has to be done on the factors such as training, which influence human judgment of speeds and distance, and on fatigue effects, which influence continuity of attention, before we can hope to solve this type of problem.

The fact that so many serious accidents continue to occur for similar reasons and on the same types of machinery year after year proves the need for the continual improvement of protective devices on the one hand, and for more effective organization for the application of safety measures on the other. This is an organizational problem, which has been partly solved in a number of factories in recent years by appointing "Safety Officers" and Safety Committees to assist management and workers to reduce the accident risks of every job in the factory.

Quite apart from the question of designing and supplying machine guards, protective clothing and eye shields to workers in the factory, there is the major problem of ensuring that these protective devices are not skillfully circumvented or set aside because they are irksome in some way to the user, or because the operator prefers to "take a chance" without knowing the odds against him. This problem can only be solved by bringing together the factory manager, the tool engineer, the protective equipment designer, and a number of specialists including the medical and psychological research worker, the safety officer, the Factory Inspector and the worker himself, on some new basis.

This again is a problem requiring research and organization, but there is a growing body of evidence to prove that it can be solved effectively in a number of ways and at different organizational levels.

POSSIBILITIES IN ORGANIZATION FOR ACCIDENT PREVENTION

(a) *Regional Advisory Panels*

In this connection, I should like to outline briefly an experiment in joint research which has been carried forward by the Advisory Panel on Industrial Accidents and Ill Health which was set up by the Midland Advisory Council on Industrial Productivity two years ago, under the Chairmanship

of Professor John Squire, Professor of Experimental Pathology, at the University of Birmingham. The Panel comprises two senior members of Midland machine-tool manufacturing companies, two industrial medical officers, a senior Trade Union organizer, H.M. Inspector of Factories, two members of the Department of Engineering Production of the University including myself, and two members of the Medical Research Council Industrial Medicine and Burns Research Unit, of which Professor Squire is Hon. Director. The Accident Hospital and the Industrial Medicine Research Unit are at the receiving end of a succession of accident cases, the basic causes of which appear sometimes to be in the machine tool design office or the production planning office, or in the continued use of dangerous and obsolescent plant, and this Panel was originally set up because it was realized that there is a growing need for the Medical Research worker, the machine tool designer, the production engineer and the worker to exchange views on each other's problems.

The earliest meetings of the Panel revealed that a common purpose activated all representatives, but they also proved that much investigation had still to be carried out on every problem raised. With the aid of the Factory Inspector, the lost time accident statistics for the Midlands area were analysed, and the most frequent and most severe causes of lost time were placed on the Panel agenda for study.

For example, a review was made of all the reportable accidents which occurred during 1948 in Birmingham and Smethwick engineering works. It was found that hand and foot driven presses headed the list of accidents caused by "machinery, power driven and otherwise", with grinding machines and lathes coming second and third. Contact with metal splinters and swarf was found to be a serious cause of sepsis producing lengthy ill-health. Out of over 7,000 cases reviewed, lost time accidents were classified, by cause, roughly as follows :—

Machinery (power driven or otherwise)	30%
Contact with materials	45%
Hand tools	10%
Supposed carelessness and untidiness	15%

These accidents resulted in 981 cases of sepsis and this has been found to cause an average loss of time of 2-3 weeks per operator when it develops. There were also 449 eye injuries among the total.

The Panel then took up a few of the most frequent and most severe causes of lost time for detailed investigation.

(i) *Studies on Hand Protection.* The M.R.C. Industrial Medicine Unit had already been active in devising new methods of treatment which reduced the average lost time due to sepsis from 3 weeks to 10 days—a great achievement in curative medicine. Swarf and metal splinters were found to account for 7% of lost time accidents in the Midland area so at this point the Panel, with the idea of moving into the attack from the prevention side, arranged for additional statistics to be collected at the factory surgery and on the shop floor of an engineering firm, to determine which types of swarf give rise to the most serious and most frequent hand injuries. The results of this investigation are of some interest since they are at variance with some commonly held opinions.

The results of the swarf studies may be summarized briefly as follows :—

	<i>Injuries</i>	<i>Activity</i>	<i>Ratio %</i>
(a) Type of metal causing injury :—			
Of the different metals, steel swarf caused most of the injuries	95%	77	
Bronze was worked only 1/30th as much and produced a corresponding small number of injuries	3%	3	
Cast iron fragments seemed relatively free from injuring effects	2%	20	
(b) Types of steel swarf causing injury :—			
<i>Needle splinters</i> caused more than half the injuries but these injuries were, on the average, of only slight severity unless these became septic	53%		
The spiral and ribbon turnings between them caused $\frac{1}{2}$ of the swarf injuries, and these were, on the whole more severe than those caused by the needles	36%		
Small steel chips	9%		
Remainder	2%		

This study is still continuing. It has already given rise to a number of ideas for the elimination of manual handling of swarf in machining operations which have still to be brought into practice in industry. The use of magnetic separators and the addition of antiseptics to metal cutting coolants have also been studied as a means of eliminating injuries from needle swarf and of reducing sepsis from swarf cuts at the source.

(ii) *Studies on Hand Presses.* Hand operated presses are normally assumed to be safe because the operator is in complete control of the machine. The factory regulations do not require hand presses to be guarded, although it is comparatively easy to arrange a pendulum type guard or to design press tools so that it is impossible to insert the fingers into the tool cavity. The large number of accidents which continue to recur with this type of press each year indicate that it is not correct to suppose that when the operator applies the motive power to a machine the situation is safely under control. Here is a case where from time to time co-ordination between the hands breaks down, and if this is dangerous, guards are essential.

(iii) *Studies on Grinders.* The lost time accident statistics indicated that grinding machines deserved special study and again with the co-operation of a large foundry fettling shop studies were made and statistics collected over a 6 monthly period of the injuries caused by different classes of grinding equipment. The figures show that pedestal grinders suffer at least 50% more injuries than the swing grinders and that when grinding cast iron, the pedestal grinders suffer nearly three times the number of injuries from flying particles—mostly to the eyes—compared with the swing grinders.

(iv) *Studies on Eye Protection.* The Panel then turned its attention to the prevention of eye injuries. Various types and designs of goggles were obtained and examined and many of these were found to be highly effective in giving a high degree of protection. Incidentally, ordinary steel rimmed spectacles give a considerable degree of protection and if properly fitted act as a shield against flying particles from 90% of the possible area of origin. Unfortunately, many goggles are uncomfortable to wear, they steam up, the glass becomes marked and obscured by flying particles, and finally, in trades where the operator has to move about and requires to use the side vision of the eyes as fully as possible for general safety, the restricted vision imposed by the design of many goggles becomes a danger in itself. Here is the human factor in the situation, and it is not surprising to find that many types of goggles are worn more often on the forehead than over the workers' eyes. Tests made on standard welding goggles which use 2 in. dia. replaceable glass eye pieces show that the vertical field of vision which can be seen without moving the head is restricted from 120° to 70° and that the horizontal monocular field of vision is reduced from 190° to 90°. Similarly the immensely important horizontal binocular field of vision is reduced from 120° to 90° or less, depending upon the size and shape of the goggle bridgepiece. On the other hand, there is virtually no restriction of the horizontal field with the curved type of one piece goggle which rests upon the cheek-bones on either side of the face. Here then is a clear indication for goggles manufacturers and users alike, and the Panel has already made recommendations to the safety glass manufacturers on this subject.

(v) *Studies on Foot Protection.* It has long been established from the Accident Statistics that the great majority of industrial foot injuries occur to the toes. Various forms of protection have been evolved, including the safety boot, which is attractive in appearance and comfortable to wear, although a pressed steel toe cap is incorporated immediately below the leather toe cap. The widespread use of the safety boot throughout industry would save many thousands of man hours now lost due to toe injuries each year. Though the value of the safety boot is recognized by managers and workers in most industries, there are serious human obstacles which prevent the wearing of these boots in the factory.

The major obstacle appears to be partly social habit, and partly economic, for although safety boots are not expensive many workers appear to keep them for "best wear" outside the factory until they have lost their new look and are partly worn out. This social habit may be difficult to overcome, but one industrial member of the Panel has found that the economic difficulty can be partly overcome by arranging to help employees to purchase safety boots by hire purchase at the rate of 5/- per week on a basis which does not conflict in any way with the Truck Acts. As a result, the sale and use of safety boots has been increased by over 100% in this particular factory, whereas previous propaganda and the use of posters and other means of education failed to make any significant difference. The Panel is now advising a number of other Companies to try the same arrangement and to keep records of the use of safety boots and of the incidence of injuries. These examples illustrate what can be achieved by joint research on a regional basis, and I would suggest that there is much to be gained by the formation of Advisory Panels on Industrial Accidents and Ill-Health in

every industrial district throughout the country, organized on a similar basis to the Midland Panel, to which I have referred. Voluntary Panels of this type can only afford time to deal with general problems such as those outlined, however. Furthermore, their work is advisory, and unless means can be found to implement their general findings and to carry forward more detailed work on a full-time basis within individual firms or groups of firms, much of their efforts are likely to remain ineffective.

(b) *The Safety Engineer or Committee*

What is required in addition to regional research activities is an acceptance by the individual manager of the task of deliberately and objectively organizing to save man-hours now lost due to preventable accidents in his own factory. Although the responsibility for using safe methods can never be delegated by the executives in charge of design and production in any factory, their efforts to maintain a steady programme for increasing safety and reducing accidents can be greatly assisted by the appointment of a safety officer or engineer or a safety committee entrusted with the specific task of running a comprehensive accident prevention and "Safety Engineering" programme.

We certainly cannot be satisfied with the progress which has been made in this direction. At present, it is estimated that there are fewer than 1,000 specially appointed safety officers in the whole of British industry. Yet British industry might well save half the man-hours now lost due to industrial accidents and in so doing could increase the national product by upwards of £50 millions per annum. This target can only be achieved if "Safety Engineering" is taken seriously, however, as a high level occupation requiring special training and skills.

The employment of a full-time safety officer or safety engineer might well be justified on economic grounds alone, in more than half the factories in this country, and as this view becomes more generally accepted by factory managers we can expect a growing demand for trained and experienced safety engineers.

Unfortunately, such men do not yet exist in anything like the numbers which would be required to carry forward a great national drive for accident prevention.

(c) *Safety Engineering as background training for Production Management*

This shortage of trained men could become an advantage in the long run, however, if industrial managers came to the conclusion that a period of one or two years as assistant engineer in charge of safety should be made part of the practical training of the production engineer, the machine tool design engineer, the work study engineer, and the junior manager. In future years there would then be a personal appreciation of the value and possibilities of safety engineering as a positive means of accident prevention among the senior men in industry and at the work planning stage where so many potentially dangerous practices might be eliminated.

(d) *Training-within-Industry on Safety*

On the shop floor level, the foreman and charge hand are the key-men in accident prevention. They have the difficult task of ensuring that safety regulations are observed and also of training their men to study the tools

and working methods used and to visualize and anticipate possible dangers. It is estimated that there are more than 750,000 foremen in manufacturing industries alone in this country. These foremen have shown themselves to be capable leaders and effective instructors of the men on the job, and a large proportion of them are skilled craftsmen who have had some part-time technical education. In addition, it is estimated that about 200,000 foremen have received training on one or more of the training-within-industry programmes which have been organised so successfully by the Ministry of Labour and National Service in this country during the past six years on the three subjects, "Job Instruction", "Job Methods" and "Job Relations". There have been one or two successful attempts to introduce some instruction in safety principles in these and other types of industrial training schemes, but in general the portion of the course devoted to safety principles and accident prevention has of necessity been very short and overlaid by the main topic. There is no doubt whatever that the Training-Within-Industry Scheme has been a very great success in British industry.

There is every prospect that a "Job Safety" programme for training in accident prevention would be equally successful and could be quickly brought into widespread use throughout the country. Job Safety programmes of this type in which managers, safety engineers and foremen can co-operate to reduce lost time due to accidents have already been used in one or two cases with great success.

(e) *The Creation of "Safety Consciousness"*

It may be considered that the elimination of human suffering through the creation of a safe working environment is sufficient incentive for men to work consistently to this end at all levels in any industrial factory. What is required, however, is some short term means for maintaining interest from week to week in safety precautions and in continued freedom from lost-time accidents in the individual firm.

Modern management practice seeks to create "safety consciousness" among foremen and charge hands by the payment of a "safety bonus" each week for an accident free record in their individual sections. Where workers on hazardous work are paid by results, "safety consciousness" is fostered by imposing a top limit on earnings at a standard safe working pace.

Poster campaigns, safety slogans and the skilful use of colour to indicate danger areas and machine parts, are also effective means of creating and maintaining "safety consciousness" among workers and staff.

These methods of creating a high level of "safety consciousness" require little more than personal enthusiasm and initiative on the part of factory managers, and they have proved to be highly effective in many instances.

In the last section, I have attempted to look to the future, and to indicate some of the possibilities which exist in a number of different methods of organization for accident prevention on a regional or individual firm basis :—

- (a) Advisory Panels engaging in research on a regional basis.
- (b) The appointment of safety officers or engineers or of safety committees in the individual factory.

- (c) The idea of making a period as safety engineer part of the practical training of the production engineer and junior manager.
- (d) The development of a Job Safety Training organized as a Training-Within-Industry programme.
- (e) and finally, the creation of "Safety Consciousness" at all levels in the individual firm.

Used properly, all these methods could be combined to span the gap which exists between the great wealth of knowledge on accident prevention which has been built up by generations of engineers, medical research workers and Factory Inspectors during the past 100 years, and its application to the points in the factory where accidents are liable to occur.

This is a sphere of action in which there is much to be done, and where the highest ethical ideals and values in the human factor can be brought into play in the development of British industry. In so doing, greater satisfaction can be derived by men at all levels in industry, from the knowledge that in this work they are co-operating effectively in building a safer and healthier way of life for their own and for future generations of workers in industry.

Training for Industry

By SIR ARTHUR P. M. FLEMING, C.B.E.

Wednesday, 5th December, 1951.

IN EVERY industry and in most industrial countries the shortage of man-power at every level is very pressing. This shortage is due to two main reasons ; the industrialisation of countries which have been hitherto relatively non-industrial and in already fully industrialised countries the effect of the armament drive. This shortage and the realisation that man-power properly trained is the greatest asset which any nation possesses is responsible for the great activity and interest found everywhere today in the training of industrial personnel. This attitude is in marked contrast to that which prevailed in the 19th century which seemed almost always to overlook the fact that juvenile labour is merely a prelude to adult labour. Then, except in those industries such as engineering, where training through apprenticeship existed, very little attempt at any form of training, other than through practice in the job itself, was attempted.

The problem which faces all those who are concerned with training for industry is that of discerning the special aptitudes of persons as individuals, equating these to the most suitable job, providing the right kind of training to enable the young person to use and develop these aptitudes to the satisfaction of himself, the industry he serves and the community in which he lives and to provide means for upgrading.

The discernment of special aptitudes has been the subject of much study by all concerned with vocational guidance and selection. It is recognised that the problem is more difficult to solve with young people entering employment at the normal school leaving age than with older entrants from more advanced schools and educational institutions. Various psychological methods for discerning aptitudes have been devised, and much research is being undertaken, but in general industry has found that the chief value of these methods is that they help to confirm suitability or unsuitability for a particular type of work measured by the more conventional methods such as school records, family background, interviews by experienced selectors, oral and written tests and the actual try-out in the job itself. The National Youth Employment Council set up under the Employment and Training Act, 1948, has given much consideration to the technique of vocational guidance and experimental schemes designed to improve such guidance have been introduced. The functions covered by the schemes are :—the collection of information about jobs and vacancies ; the preparing of young people for their choice of work ; the collection of information about school leavers ; the matching of the job and the young person ; placement and reviewing of progress. The ideal of vocational guidance is that a youth should go into the job that is right for him, because only then will his future career be a satisfying and satisfactory one. Unfortunately, individual choice is not always compatible with opportunity and industrial needs.

Having decided the desirable type of employment, suitable initiation into the job is important. The young entrant needs to be made acquainted with

the purpose of the industry he has entered and its place in the national economy. He needs to know something of the set-up of his own organisation, what are the relations between its integral parts, what are the human relationships within it. He must be made to feel that he is part of something that is vital to the community's well being and that his job, well done, is essential to the well being of the whole. Despite the efforts that are being made this is one of the phases of industrial training that falls far short of the ideal.

Young people enter industry from three educational levels; the normal school leaving age of 15+ years ; the secondary grammar and technical schools at 16 to 18 years ; and the universities and technical colleges. At the first of these levels, the normal school leaving age, industry does not look for personnel that is in any sense "trained". The function of the school is to provide the best general education that can be given in the time available. To attempt any narrow vocational or technical training is detrimental to the young person and in the long run to industry itself. Similarly, at the second educational level any vocational education should be subservient to general education but it is the function of these schools to appreciate that their students will become workers and that it is their responsibility to create the right attitude of mind to work.

In earlier days practically all entrants to industry came in at the earliest school leaving age and remained craftsmen except for the few who possessed the initiative and determination to climb upwards to managerial rank and were pioneers in founding industrial organisations. A matter of primary importance in these days is the need to provide for upgrading so that no matter at what educational level a young person enters industrial work, the way is open for him to acquire the training and experience necessary to enable his aptitudes to be used to the full.

A review of our traditional methods of industrial training throws much light on our present practice. The foundations were laid in the middle ages when the Gild system of apprenticeship provided not only training for craftsmanship of the highest order but also a sound general education by the standard of the times for those who were apprenticed. The system survived until the 19th century when various influences, some economic, some social and some political, led to its decline though it continued to be practised in those trades which demanded a high degree of manual skill.

Reviewing the past century in relation to industrial changes and their bearing on training for industry the most outstanding was the coming of the machine era in which the old hand processes gave way to machinery. The demand for power and power mechanisms established engineering as a basic industry on which all other industries depend so that training schemes in the engineering industry were established early and tended to provide the pattern for subsequent schemes in other industries. In the early 20th century the development of power mechanisms, the use of tools of precision and mass production methods created the impression that intensive handicraft training in the industrial arts was no longer of primary importance. This conception which led to a decline in engineering apprenticeship had to be rectified because the manufacture of the tools of production calls for handicraft skill of the highest order.

Another factor which has exerted great influence on training for industry has been the development of technical education which had its foundations in the Mechanics Institutes, first started in 1824 to teach the underlying principles of the mechanical inventions that arose in the period of the Industrial Revolution. Great impetus was given to technical education by the Great Exhibition of 1851 which showed that in some respects we were falling behind our industrial competitors. In 1880 the City and Guilds Institute for the encouragement of the teaching of applied science in schools and evening classes was set up. Finsbury Technical College, founded in 1883, was an important influence in the development of similar institutions. Later the City and Guilds Central College was opened and the Polytechnic Movement followed. Evening technical schools developed side by side with evening continuation classes for general education and have always played an important part in training for industry though the traditional view, which did not break down until after the First World War, was that the technical instruction given should not include the practice of any trade.

Throughout the 19th century, technical instruction was largely moulded by the examinations of the Science and Arts Department and the City and Guilds of London Institute. Another examining body formed in 1847 as a union of the Mechanics Institutes in Lancashire and Cheshire is still actively in existence at the present time. A later development was the national certificate scheme whereby certificates and diplomas were given as a reward for 3 to 5 years systematic study. The first move was made in 1921 when the Institution of Mechanical Engineers, in conjunction with the Board of Education, developed a scheme to issue ordinary and higher national certificates in mechanical engineering and ordinary and higher national diplomas to full-time students. Within a few years certificates and diplomas were available in electrical engineering, chemistry, building, marine architecture, textiles and commerce. The introduction of this scheme entirely revolutionised the work done in the senior technical institutes.

Though full-time courses of technical education were developed during the same period as the evening technical classes their growth was slow. The Report on Education for Industry and Commerce issued by the Board of Education in 1928 showed that in Germany only about 10% of the technical schools provided evening classes, in the U.S.A. less than 30% whilst in England evening classes accounted for between 80% and 90% of the total number of students.

Under the Education Act of 1902, the majority of the organised science schools became secondary schools. The new junior technical schools fell into two groups ; those which prepared pupils for particular trades and occupations (trade schools) and those which gave an education to pupils who wished to enter a particular industry but not a specific occupation within that industry (the normal junior technical school). These latter generally formed part of the larger technical colleges.

The moving spirit behind a great deal of the progress made in technical education in the past 20 years has been Lord Eustace Percy who, when President of the Board of Education, wrote in 1933, "the wastage of human material is of course only one aspect of the problem of technical education.

The other aspect is that of industrial efficiency in a scientific and severely competitive age, which calls for continual improvement in the technical equipment of the individual worker".

The Second World War not only emphasised the value of technical and technological education for the nation but it also revealed the lack of co-ordination between the different types of institutions responsible for it. The distinction usually made between "technical" and "technological" training is that whereas "technical training" applies to the work of the evening institutes and technical schools and colleges, "technological training" denotes the higher study and research appropriate to the universities and central technical institutions.

In order to link up the bodies concerned with higher technological education so that their work could be closely co-ordinated a special committee on Higher Technological Education under the chairmanship of Lord Eustace Percy was appointed in 1944. From the evidence submitted it was apparent that "the position of Great Britain as a leading industrial nation is being endangered by a failure to secure the fullest possible application of science to industry and that this failure is partly due to deficiencies in education". The annual intake into industry of men trained by universities and technical colleges was regarded as inadequate both as to quality and quantity and the report stressed the fact that "the greatest deficiency in British industry is the shortage of scientists and technologists who can administer and organise and can apply the results of research and development". The report urged that technological education must be conceived in terms of a combined course of works training and academic studies—a view very contrary to the traditional view that technical education which is concerned with the principles of the industry and their application should be quite distinct from works training.

The demand for scientific and technical personnel far exceeds both the available supply and the training capacity of the universities and technical colleges. Much consideration is being given at the highest level to the best use of the available man-power. An upgrading at all levels is required. The problem is acute but all parties associated with it—education, the professions, industry and government—are conscious of it.

With the increasing size of industrial units and the complexity of industrial organisation the need to raise standards of management is fundamental. Good management depends on men and women capable of displaying outstanding qualities of leadership at all levels. No formal course of training for management will produce good managers unless the inherent human qualities required are there. Many of the progressive firms have been training for management for a long time by selecting suitable men, giving them a wide range of experience and seconding them as assistants to higher executives. There is no doubt that given students who possess the right personal qualities, schemes of a more formal character can be immensely useful. The administrative Staff College at Henley has shown what can be done for 60 people in three months and in some technical colleges a start has already been made along the lines suggested by the Urwick report of 1947 and the work is increasing. A team sent to the United

States by the Anglo-American Council on Productivity has just published its report. "Education for Management" is the work of the group led by L. F. Urwick including representatives from industry, education and the trade union movement. While it does not answer the questions "Should British Universities follow American practice and arrange courses in business administration at undergraduate and postgraduate levels and is there such a thing as scientific management and if so can it be reduced to a university discipline", its admirable description of American practice should stir up serious thought in this country.

When we come to consider training for industry by industry we find that while in general the progressive industries have been ready to accept the burden and responsibility there are many others that have been backward in this respect so that schemes of training are in a very unequal state of development. However, the difficulty of recruiting sufficient personnel and the stimulus of legislation are causing many industries to begin seriously to consider the matter and now some 70 sections of industry have produced systematic schemes of recruitment and training and have set up machinery to implement them. The nationalised industries are obliged by Statute to tackle the subject. Many of the schemes in existence and projected are bold and farsighted and show a growing realisation that training must be "a continuing and progressive process throughout the working life and at all levels".

I have mentioned that schemes of training in the engineering industry were developed early and have tended to provide the pattern for the development of schemes for other industries. As I have been associated with engineering all my life and with an organisation in this district I plead no excuse for using the training schemes of this Company to illustrate some of the points I have made. Some of our schemes of training are 50 years old but we have always tried to maintain a forward looking attitude of mind to them and to adapt and modify and introduce entirely new methods when the old ones no longer serve their purpose.

We have schemes of training for *all* grades of personnel from all the educational levels and our methods of upgrading are such that it is possible, given the ability, determination and capacity for work, for a youth who has entered at the early school leaving age to proceed to the highest levels of employment the Company can offer. Our method of discerning inherent capacity for a particular craft is to put all probationary trade apprentices into a Works Training School for one year. During this period the youth is tried out under skilled observation in a variety of trades before he is assigned to the wider training experience of the workshops, where throughout his apprenticeship he is under observation. For university graduates the period of apprenticeship is two years, during which a young man will get sufficient experience to determine whether he is best suited for technical design, research, works production or home or overseas selling. Generous day release is given to all grades of personnel.

The Company's school, now run in conjunction with the County Education Authority, is recognised as suitable to become one of the County Colleges to be ultimately set up under the Education Act of 1944.

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